A METHOD
OF
SELECTING AND EVALUATING MATERIALS

FOR A COURSE IN

INTRODUCTORY GEOGRAPHY FOR TEACHERS'-COLLEGE STUDENTS

(With Emphasis on the Home Region)

FOR A

PROFESSIONAL SUBJECT-MATTER TREATMENT

By
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E. E. L.

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INTRODUCTION

The age-old story of man's persistent effort to make better and better use of the natural environmental conditions about him is one of continual interactions. On his ability to interpret the relations between his desire for better things and the natural environmental situation by which many of his activities were limited, depended largely his welfare.

Man's progress in the world is measured in many respects by the degree of his success in understanding and taking into account the varied and ever-changing elements in the environmental complex. The history of his conquest of the earth is inextricably interwoven with his attempt to learn more and more of nature's ways and organize them into his experience.

Geography is that division of human knowledge which takes for its central theme the relationships between human interests, activities, and experience on the one hand and the natural environmental complex on the other. In its best sense, geography is an areal and inter-areal study, always interested in the relationships between specific peoples and their areal home. Although much of geography down through the centuries has sought an understanding of such relationships, yet it is within recent times only that geographers have become keenly sensitive to this point of view.

The textbooks in geography for the public schools two or three decades ago were almost wholly descriptive and factual in their nature. The new books run very strongly to the explanatory, emphasizing especially the regional and inter-regional aspects of the subject.

The change in point of view of present-day textbooks in geography from those of twenty or thirty years ago has made the problem of teacher-training in geography an especially difficult one. The old geography called very largely for a training in concepts concerning facts and things, and as a result stressed almost wholly the memory aspect of the subject. The new geography, emphasizing as it does a study of interactions, calls also for a study and understanding of concepts of relationship.

This investigation, therefore, aims to take account of the situation thus arising and point the way to some possible improvements, both as to materials and methods.

CHAPTER I

THE PROBLEM AND SOME OF ITS IMPLICATIONS

Statement of the Problem

The course in introductory geography for teachers'-college students is clearly in need of carefully selected and thoroughly organized units of subject-matter materials which are basic to all serious and well-ordered work in the subject.

Teachers need to know just what the *very important materials* are for such a course. They should know, too, what *marginal materials* are essential to maturity of thought in the work they are teaching.[1]

It is highly desirable, also, that teachers of geography in teachers' colleges be aware of the *possibilities of illustrating geographic concepts out-of-doors in the home area.*[2]

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[1]"However badly carried out, the aim (of the author) is to be both philosophical and practical. An attempt is made to formulate a philosophical basis for teaching the subject, and to indicate methods of dealing with it which will be in agreement with such philosophy." *Fairgrieve, Geography in School,* page v.

"Geography will not be able to come into its own until there is a reasonable degree of agreement among teachers of the subject. . . . We have now to reach an agreement as to the range of facts, physical and biological, which may be looked upon as the raw materials of geography." *Fairbanks, Real Geography and Its Place in the Schools,* page 32.

"Geography presents such a richness of material that the teacher must be able to make an effective selection of the fundamental items and to reorganize them to purposeful ends. . . . Geography is not the same today as it was yesterday, nor will it be the same tomorrow." *Thralls and Reeder, Geography in the Elementary School,* page 14.

"A geography for teachers should provide a systematic study that will enable the student to master the content on a college level. It should be intimately related, however, to teaching values. . . . There is no single volume that meets the needs of the teacher for geographic content." *Branom, A Teacher's Geography,* page vii.

[2]". . . if the continued growth of the children is to be assured, certain geographic concepts should be developed as a basis for both the present and future work. These concepts must grow out of the home and local community and they should be tested in the light of the modern conception of geography; they must show man's response and adjustment to his (natural) environment." *Thralls and Reeder, Geography in the Elementary School,* page 41.

"The study of home geography does not find its chief recommendation in the local information which it provides, but rather in the aid that it furnishes through local examples to the general study of geography, by giving full meaning and reality to geographic facts and relationships the world over." *Davis, W. M., Journal of School Geography,* Vol. I, page 2.

"Many teachers there are who as yet seem to fail to grasp the significance of home geography and its absolute necessity, not only as a prerequisite but as a concomitant in the study of world geography." *Fairbanks, Real Geography and Its Place in the Schools,* page 75.

This study undertakes to find a satisfactory way in which these things may be done.

The Procedure Outlined

In attacking the problem, the procedure followed by the investigator involved:

1. Searching the writings of recognized leaders in educational thought for materials whereby some guides in the nature of principles, assumptions or criteria might be found and formulated. These guides were useful especially in helping to determine what geographic materials were educationally significant.

2. Cataloging, organizing and validating geographic subject matter in the form of questions for a course in introductory geography for teachers'-college students by the use of the assumptions and criteria set up in (1). The subject matter selected is implied in the questions listed in Appendix B.

3. Setting up criteria and directions for rating the various items of subject matter relative to importance and also as to the possibilities of illustrating the materials out-of-doors in the home area, together with the criteria for the selecting of judges to do the rating. This phase of the study is included largely in Chapter II.

4. Scoring and interpreting the judgments of the two groups of raters, and classifying the rated questions into percentile steps. Chapters III and IV are given over largely to this work.

5. Stating, tentatively and in declarative form in Chapter V, some of the concepts of relationship involved in one section of the rated questions.

6. Utilizing the section of rated questions dealing with Rivers and Associated Features in setting up a typical unit of professional subject-matter material for teachers'-college students. This is Chapter VI of the study.

7. Stating the conclusions, implications and contributions of the study in Chapter VII.

Geographic Materials as Related to Educational Thought

The Nature and Value of Subject Matter. Every item of subject matter taught in the public school should be able to justify its place in the course of study. In order to do this it should be able to show that it contributes both to the welfare of the individual and also to group living. But the welfare of each individual is so intimately interwoven with the welfare of the groups with which he is associated

that a proper evaluation of educational materials involves a wise integration of many values.

The Contribution of the Sociologist. The educational sociologist presumes to know something of the crucial problems of present-day social living, especially those problems that are pertinent to the public school situation. In selecting materials suitable for the public school curriculum, we should have in him a wise counselor. An understanding of group living is his special interest. He assumes that the public school should emphasize a study of the crucial problems of present-day social living and that by so doing the rising generation will learn how to attack the problems of a healthy, evolving society. This, he insists, the public schools have not been doing.[3]

The Contribution of the Psychologist. The educational psychologist studies the ways in which the individual learns. The individual is his chief concern. He assumes that the human animal, born unspecialized in many respects but with marvelous capacities to learn, actually does learn through his contacts with a multitude of variable environmental situations. Unfortunately there is at present wide disagreement among psychologists as to the nature and varieties of learning and as to the forces or factors that control learning.

The Contribution of the Philosopher. The educational philosophy that is followed in this study takes an overview of the whole school situation and attempts to see how the values presented by the various specialized fields fit into a unified whole—how the individual is to serve both his own needs and the groups with which he is associated, and how the groups are to serve one another and also the individuals of whom the groups are composed. It assumes that the various points of view relative to the individual, society, and the impinging environmental materials should be integrated and also that the human organism learns by the "continuous reconstruction of experience". It insists that this is the way the individual learns to adjust his interests and activities to existing environmental situations, and to bring his in-

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[3]"America is now peculiarly awake to the need of greatly improving the quality of her enormously extended and elaborated systems of teaching and other growth controlling processes already so expensively developed." *Snedden, David, School Educations: Sociological Sources of Values,* page 1.

"American society is not planned. . . . Even the school system, though exhibiting a certain logic, was never planned as a whole. . . . If America has no social program, the schools can have no such program. As a consequence the promotion of an intimate and functional relationship between school and society becomes difficult and the teaching of patriotism tends to assume a negative form." *Counts, George S., The American Road to Culture,* page 174.

"The social process is not only the product of the learning process; it is the educative process itself. . . . Formal schooling is designed merely to furnish such information as the social process itself does not adequately teach." *Finney, A Sociological Philosophy of Education,* page 149.

genuity to bear in modifying situations that are wholly or partly under his control.[4]

The Contribution of the Geographer. The educational geographer assumes that he sees more deeply into some phases of human interest and activity than do the specialists just mentioned. He thinks that he sees potential values of which the others are not aware.[5] Whatever he offers from the field of geographic interest to be included in the curriculum of the public school, however, must satisfy not only certain criteria which he sets up, but also such criteria as may be acceptable from the fields of educational sociology, educational psychology, and the philosophy of education. Acceptable subject matter in geography for the public-school curriculum, then, must satisfy a series of well chosen and carefully integrated criteria selected from the several fields of interest that specialize in a study of public-school children and their needs.

Some Assumptions Basic to This Study

The present investigator, without attempting to designate the special fields of interest from which the materials are chosen, has set up cer-

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[4]"There comes a time in developing civilization when in a given society the possibilities of education have become so great that the matter cannot wisely be left to incidental results of endeavors otherwise conducted. . . .

"First in immediacy of connection with economic planning and with the task of helping our people to think about it is the obligation to help supply the needed expert knowledge. We have within one profession probably the chief economic experts in the country. These men must come forward as leaders to help plan and educate. . . .

"Second, . . . We must come to see jointly and severally that education and the social situation are so inextricably interwoven that we cannot truly educate except as we admit the social aim and responsibility and remake on this basis our whole school content and procedure. . . .

"Finally, our task throughout is cooperative, all of these things must be thought through together by the various members of the profession. It cannot be the exclusive work of experts." *Kilpatrick, W. H., Education and the Social Crisis,* pages 46-49.

[5]". . . geographers in increasing numbers define their subject as dealing solely with the mutual relations between man and his natural environment. . . . Thus defined, geography is the science of *human ecology.*" *Barrows, H. H., Geography as Human Ecology,* page 3.

"Geography may be defined as the science which studies the reciprocal relations between man and his natural environment." *Huntington and Carlson, Environmental Basis of Social Geography,* page 5.

"Geography is the exact and organized knowledge of the distribution of phenomena on the surface of the earth, culminating in an explanation of the interaction of man with his terrestrial environment." *Mill, H. R., The International Geography,* page 3.

". . . our science offers a new conception of the interrelationships between earth and man—a conception resulting from a more synthetic knowledge of the physical laws governing our earth and of the relations between the living beings which inhabit it." *Blache, Vidal de la, Human Geography,* page 4.

tain principles and assumptions to guide him in his work. It is appropriate at this point to designate what these are and how they apply to the problem under consideration.

1. The human animal as contrasted with other animals is born with a marvelous capacity to learn. The organism learns in part through its contacts with and manipulation of its environment.[6] The particular phase of environment upon which the geographer centers his attention is the natural environment as contrasted with the social.

2. A psychological hypothesis accepted by the writer is that the human organism learns what it practices. It is desirable, therefore, that practice be given in those life situations that are meaningful in the present and probably have large prospects for usefulness in the future. The geographer has a rich body of materials to contribute at this point.

3. It is an hypothesis of educational philosophy and accepted by the writer that the human organism learns through the continuous reconstruction of experience.[7] The materials the geographer has to offer for the reconstructive processes are those with which the organism is in continuous contact and which must almost always be taken into account, namely, the natural environmental elements.

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[6]"Some kinds of environment will affect or modify some individuals, while other kinds of environment are needed to modify other individuals. There is thus a continual interplay between the individual and his environment. . . . In what follows we shall emphasize merely the effect of the environment in causing the change." *Pintner, Educational Psychology,* pages 185-186.

"The behavior of living organisms cannot be considered apart from the environment in which their reactions occur. . . . The conditions of the air in which one lives has been recognized as a factor. . . . So far as the behavior of the individual is concerned, climatic conditions which are extreme in neither direction are conducive to the greatest activity." *Poffenberger, A. T., Applied Psychology,* pages 164-206.

"If the individual's structure depends upon both heredity and environment, so does all the individual's activity. . . . Heredity is the individual himself. And environment is not something that forces itself into the individual or is somehow added to the individual. Environment is a vast collection of stimuli that arouses the individual to responsive activity." *Woodworth, R. S., Psychology,* pages 186-188.

[7]"It (education) is that reconstruction and reorganization of experience which adds to the meaning of experience and which increases ability to direct the course of subsequent experience." *Dewey, Education and Democracy,* pages 89-92.

"To up-build the self is then to improve one's working stock of meaning, making them ever more numerous, ever more inclusive of the rich potentialities of life, ever better validated, better and better refined and defined, ever better organized—and finally ever better obeyed as these better meanings are efficiently worked up into appropriate plans of action." *Kilpatrick, A Reconstructed Theory of the Educative Process,* page 12.

4. We are living in a period of rapidly shifting values.[8] It is difficult to assess the conventions, the formulas, and the institutions of a people in such a time. The geographer realizes that the values with which he works are largely of a variable nature and knowing this he is very cautious in the stating of principles and concepts of relationships. He realizes that generalizing is precarious. For this reason, he insists that the principles and concepts of relationships which he states and uses are held tentatively—subject to frequent changes as the constituent elements change or are better understood.

5. It is assumed that the public school is an institution created by society to acquaint children with the best in human knowledge and achievement in order that this material may be brought to bear in the reconstruction of experience as the crucial problems of present-day living crowd into the foreground.[9] Since problems of this nature so

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[8]"Our times are changing. . . . For one thing, communication improves. . . . Machine production encroaches more and more upon the domain once held by the individual man's hand and brain. . . . War increases in inclusiveness and, in certain respects, in destructiveness." *Kilpatrick, Education for a Changing Civilization,* page 7.

"But during the past generation and a half social changes of the most profound character have shattered the old order, and on its ruins there is arising a highly integrated mechanical civilization which is marked by vast industrial combination, minute divisions of labor, complicated monetary arrangements, intricate systems of transportation, wide differences in wealth and income, commercialized amusements and recreations, the relaxation of moral standards and sanctions, the repudiation of ancient philosophies and theories of the universe, and the general heightening of the tension of life. To this new order our educational policies and programs have but partially adapted themselves." *Counts, George S., The American Road to Culture,* pages 7-8.

"History teaches that all periods of transition are necessarily problematical and critical; and the more we scrutinize details the more we see that it cannot be otherwise with ours. For there is scarcely an ideal or institution of society but is either in obvious flux, or at least seriously called into question." *Finney, Ross L., A Sociological Philosophy of Education,* page 123.

[9]"While we cannot be sure of the precise detail of future social problems—and for real education it is better so—we can within limits foretell that certain unsolved problems will press for solution. These with proper care for age and interest will furnish excellent subject matter for the kind of study demanded above for the unknown future. Here methods of attack upon that shifting future can be worked out and learned. That teachers do not know the answers to the problems will help, not hurt, the work. . . . The American people . . . must learn . . . to tolerate the discussion of controversial questions." *Kilpatrick, Education for a Changing Civilization,* page 110.

"*Problems of the People of Brazil.* Brazil is rich in natural resources, but their development has been slow. What the country needs most is a greater number of energetic people with capital to develop these great resources. The country is rich in minerals, but comparatively little mining is done. In the streams are many falls and rapids, but the water power is not used as it might be. There are vast areas well adapted to grazing, but as yet these are not utilized. The great forests of the Amazon lowland are rich in rare woods and other resources which remain practically untouched by man. How to increase the use of these varied riches is one of the problems of the people of Brazil." *Dodge-Lackey, Advanced Geography,* page 249.

often need to be considered in the light of the natural environmental background, the geographer has a wealth of indispensable materials to contribute to their solution.

6. In the continuous reconstruction of experience it is assumed that the organism is served best by those concepts of facts, things and relationships that have been learned through objective experience. The vivid organized body of meanings learned through first hand contacts with the environment are an indispensable and valuable asset in the construction of new patterns of thought and action. For this reason the geographer places a high value on a study of the home region of the child—the area where concepts can be learned first hand.

7. The present writer takes the position that geography is neither a social science nor a natural science, but rather a socio-natural science, stressing in fact the relationships between the human phenomena of the former and the natural phenomena of the latter.[10] Modern geography, therefore, directs attention to a study of the relations between human activities and natural environment within specific areal units. The areal unit in which one learns the fundamental concepts upon which the foundations of geographic understandings are based is the home region. For this reason, every question in this study has been rated relative to the possibilities of illustrating it in the home area.

The Classification of the Questions

It is difficult at present to state clearly geographic concepts of relationships. This is due in part to the difficulty of isolating the factors involved in most geographic relationships, and in part also to the variable nature of so many of the factors. For this reason, this study is concerned largely with questions which call for a knowledge of and ability to use the potential concepts involved. Because of the variable nature of the elements in a given concept of relationships, it is assumed that ordinarily it must be stated and held tentatively, evolving and growing as the elements change and as the accretion of new materials enter into the reconstruction of geographic experience.

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[10] "Modern geography, or human ecology, . . . is the study of the relationships which exist between human life and the natural environment; between human activities on the one hand and the natural scenes of such activities on the other; between, for example, man's traveling, playing, building, earning a living and the natural environment of lake and river, forest and prairie, soil and mineral, rain and sunshine. Under this philosophy, geography deals neither with man or the earth per se, but with the relationships between the two . . ." *Burton, The Supervision of Elementary Subjects* (Contributed by Leppard), pages 296-297.

"All over the world the people of different places vary in appearance, dress, manners and ideas. They eat different kinds of food, and enjoy different pleasures. They differ in the way they work and get a living and in their government, education, and religion. Above all they differ in their capacity for work. These differences . . . arise largely from differences in geographical surroundings, or physical environment, to use a more technical term." *Huntington and Cushing, Principles of Human Geography*, page 1.

The lists of questions are grouped in harmony with the generally accepted notion that geography is a study of the relationships between items of human interest and items of natural environment. In this investigation the natural environment is broken up into its several large divisions, and the questions relative to human interest classified under these divisions.[11] Of course, the parceling out of relationships on this basis does not mean that the concepts involved, therefore, can be narrowly limited. For instance, in considering the influence of soil on the growing corn, it is practically impossible to rule out related variables, such as soil management, surface features, climate, and the many other pertinent factors. So while a question may call for a knowledge of certain relationships, it is understood that any statement of the concepts involved assumes the limitation imposed by the question and that, therefore, the statement is tentative.

The Rating of Questions Versus the Rating of Stated Concepts

Questions may have intricate and far-reaching significance, but it is comparatively easy for one to rate them as *very important* (A), *important* (B), of *little importance* (C), or *not geographic* (D), because the quality and adequacy of the associated concepts are not necessarily involved in the rating. But when the statements of concepts covering implications of the questions are up for consideration,

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11 THE ELEMENTS OF HUMAN GEOGRAPHY

Physical Conditions	*Life*	*Human Responses*	
I. Location		a. Material Needs	(1) Food and Drink (2) Clothing (3) Shelter (4) Tools (5) Transportation
II Land Forms	A. Plants	b. Occupations	(6) Hunting (7) Fishing (8) Herding (9) Farming (10) Lumbering (11) Mining (12) Manufacturing (13) Commerce
III. Bodies of Water	C. Man		
IV. Soils and Minerals	B. Animals	c. Efficiency	(14) Race (15) Health and Energy (16) Recreation
V. Climate		d. Higher Needs	(17) Government (18) Education (19) Science (20) Religion (21) Art

Huntington and Cushing, Principles of Human Geography, page 3.

decisions of larger significance have to be made, and therefore, many and variable factors must be carefully weighed. Since the variable factors rarely can be measured with mathematical exactness, the whole statement of the relationship is thrown into the realm of reflective thinking. In other words, the judging of questions is not so much in the realm of the controversial as is the judging of exact and perhaps dogmatic statements. For this reason, it was decided to have questions rated rather than declarative statements of geographic concepts.

The Relative Importance of the Concepts Involved in the Questions

Not all of the potential concepts covered by the questions are of equal importance. Of the truth of this assumption we may be certain. Since introductory courses in geography in teachers' colleges vary in length, and since a certain amount of flexibility in content is essential, it is desirable that some criteria of relative importance of the questions be set up. The investigator has set up such criteria and through their use has employed the services of a large number of competent judges in assigning relative values to the questions.

Possibilities for Illustrating the Potential Concepts in the Home Area

A large proportion of the potential concepts involved in the lists can be illustrated either in miniature or in reality out-of-doors in the home area. Since this is so important a phase of an introductory course in geography for teachers'-college students, the investigation provides for a rating of the questions in this respect. If even a small proportion of the raters see such possibilities in connection with a particular potential concept, this may be taken as evidence that all teachers of introductory courses in geography should search diligently for such possibilities.

CHAPTER II

TECHNIQUE IN ARRIVING AT CORE AND MARGINAL MATERIALS

The Major Factors of Natural Environment

The assumption that geography involves those concepts that are essential in explaining the interaction of man with his natural environment furnished the key to the grouping of the implied questions. The natural environmental factors taken into account are the physical and biological. Both of these are potent influences in their effects on man's interests and activities. The physical environment includes *location, land forms, bodies of water, soil and minerals,* and *climate.*[1] The biological environment includes plant and animal forms. These divisions and subdivisions of the natural environment furnish the basis for the classification. Under each of these large divisions of natural environment there are several sections. For example, the large division, *Land Features of the Earth,* includes four subdivisions, namely, (1) Rivers and Associated Features; (2) Plains; (3) Rugged Lands; and (4) Inland Waters.

Original Lists of Implied Questions[2]

This study includes materials on just one of the major factors of natural environment in its relations to man's interests, activities and experience, namely, *Land Features of the Earth.* The topic is intro-

[1] *Huntington and Cushing, Principles of Human Geography, Chapter I.*

[2] The implied question as used in this study generally may be thought of as the interrogative clause in an indirect question. In most cases, the indirect question can be completed by prefixing some such term as *tell, explain, enumerate, interpret, make clear,* etc. For example, implied question No. 3 (How the nearly level lands in my community are now used) can be made an indirect question thus: *Explain how the nearly level lands in my community are now used.*

On the other hand, the implied question usually may be transformed into a real question either by supplying the remainder of the verb or by moving the verb to the appropriate place. For example, implied question No. 3 (See Appendix B) can be made into a real question by moving the verb *are,* thus: *How are the nearly level lands of my community now used?* Implied question No. 54 may be transformed into a real question by inserting the auxiliary verb *do* in the appropriate place, thus: *How do streams in my community secure their supply of water?*

Moreover, it may be seen that each of the implied questions is an item under a large topic, and correct usage does not require that such items be stated as complete sentences. It is thought that increased brevity, greater flexibility, and less monotony are secured by the use of implied questions. Only nine of the three hundred sixty items listed are not put in implied question form. These, however, may be transformed easily either into direct or indirect questions.

duced by a series of *Implied Questions Concerning the Uses Made of the Land in My Community,* and followed by the four subdivisions named in the preceding paragraph. Under each of the subdivisions is listed a large number of implied questions, each of which calls for a study and understanding of one or more geographic concepts.

The implied questions involve the materials on *Land Features of the Earth as Related to Man's Interests and Activities* contained in several of the outstanding textbooks used in introductory courses in geography in teachers' colleges.[3] These texts were studied carefully for the purpose of finding the important materials treated therein, and implied questions were constructed to cover these materials. Care was taken to include in the proposed material much more than probably would be included finally in the topic.

In addition to the implied questions based on textual materials, many were constructed which involved land features found in almost every community. The investigator was assisted very materially in supplementing the lists by a graduate seminar class in geography in education.

Finally, fifty-three judges were requested to add items to the lists and offer critical suggestions. Some suggestions concerning the interpretation of listed items were made, but no additional implied questions were proposed.

Revising and Refining the Lists

After the implied questions were first assembled into classified lists a careful checking indicated that the assumptions back of some of them were not tenable and in other cases even erroneous. In each case the implied question was modified so as to eliminate erroneous or unreasonable assumptions. After the lists were tentatively completed, the items were given a preliminary trial rating by the seminar group mentioned above. This was done for the purpose of testing the rating technique employed in the study. Several improvements in the directions for rating were suggested by the trial rating. The final directions for rating are given in Appendix A.

The Use of the Expression, Geographic Concept

The word *concept* in this study is given a liberal interpretation. Two types of meanings are recognized:

1. Concepts of things or facts.
2. Concepts of relationships.

First, as to *concepts of things or facts,* the meaning may involve:

a. *A concept of a particular thing or fact.* For example, an individual hill (Branson's Hill or Bunker Hill), or the population of Italy in 1921 (38,711,000).

[3]See publications in college geography in the bibliography.

b. *A concept of a generalized thing or fact.* For example, a delta (including characteristics that all deltas have in common), or 20 inches of rainfall.

Second, as to *concepts of relationships,* the meaning may involve:

a. *A concept of a particular relationship.* For example, the relation of the Union Pacific Railroad to the Platte Valley, or the relation of the location and growth of New York City to the Mohawk-Hudson Gateway.

b. *A concept of a generalized relationship.* For example, the tendency for transportation routes to follow valleys, or the tendency for cities to develop at the lower end of great rivers and valleys.

Of course, the concepts here indicated are those called for by the implied questions. It is a part of the purpose of this investigation to illustrate how concepts of relationships may be developed from a study of the implied question.

Criteria Used in Validating the Implied Questions

The validity of the implied questions is determined by the nature of the concepts they suggest. For this reason several criteria have been set up, upon which are based the selection of geographic materials for a professional subject-matter course in introductory geography for teachers'-college students. These criteria have grown out of a consideration of the needs of the individual and of society as set forth in Chapter I under the heading of *Some Assumptions Involved in the Problem.*

1. *The criterion of human interests and activities.*[4] Those interests and activities involving man's material needs, his occupations, his efficiency and his higher needs are the important elements to consider in connection with this criterion. However, any item of human interest or activity, to qualify as geographic, must also satisfy some other criteria.

2. *The criterion of natural environmental conditions.* The factors of natural environment include the physical and the biological. The former may be separated into five elements, namely, *location, land forms, water bodies, soils and minerals,* and *climate.*[5] The latter is made up of the plant and the animal phases. The classification of the lists of implied questions is based on this division of natural environment.

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[4] *Huntington and Cushing, Principles of Human Geography,* Chapter I.

[5] See Appendix C.

3. *The criterion of relationships or interactions.*[6] The search for concepts of relationships or interactions between natural environmental conditions and the human activities within areal units constitutes the essence of real geographic study. Learning concepts of things and of factual material is only preliminary to effective work in geography. More than eighty per cent of the implied questions call for the constructing and understanding of concepts of relationships and interactions. The nearly twenty per cent of implied questions calling for the building of concepts of things and facts usually involve merely memory materials or features of natural environment that are more or less narrowly limited as far as geographic relationships are concerned.

Since the undifferentiated field of human knowledge, interest and achievement furnishes so large a part of the materials of geographic study, and since it seems desirable in an age of specialization not to forget the essential unity of things terrestrial, perhaps the assumption that this may be called the *criterion of unity* would be admissible.

Of course, it must be admitted that geography in its search for relationships, repeatedly calls upon the matured researches of specialized fields of human knowledge. But this really emphasizes the need for the criterion of unity—a unity which the search for geographic relationships promotes.

4. *The criterion of local applicability.*[7] In the selection of materials for the introductory course in geography for teachers'-college students, the assumptions and principles set forth in Chapter I have been kept in mind. This is necessary if the course is to involve training in the ability to use the objective geographic materials of the home area. For this reason, each implied question has been rated relative to the possibilities of illustrating the underlying concepts either in miniature or in reality out-of-doors in the home region.

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[6]"A geographic principle is a fundamental truth concerning the relationships existing between man's activities and his natural environment. . . . A geographic principle is a mental concept, . . . a generalization which must be seen in wide operation to be appreciated." *Ridgley, Geographic Principles,* page 2.

"Principles of geography are the laws of geographic interpretation, the rules for solving the problems dealing with the relationships between man's interests and activities on the one hand and the natural environment on the other." *Lackey, Earl E., Studies in the Principles of Geography,* page 4.

[7]". . . home geography presents several phases of difficulty. There are elements that are suitable for presentation to the earliest grades, other phases adapted to the upper grades, and some portions of sufficient difficulty to engage the best efforts of high school and college students. Home geography is a regional study whether in elementary school or later." *Lackey, E. E., The Classification and Use of Geographic Principles, Journal of Geography,* Volume XXIII, No. 2, page 68.

5. *The criterion of outside applicability.*[8] In the learning process old meanings are continually being rearranged into new patterns. In geography the call for the construction of new patterns of thought in connection with the study of distant areas is ever present. A large assortment of carefully developed and well classified meanings (concepts) is necessary in the study of areas not accessible to the student. Geographic study continually calls for the reorganizing of concepts of both facts and relationships into new patterns of experience.

6. *The criterion of crucial present-day problems* (See assumptions in Chapter I). One of the most caustic and perhaps one of the most justifiable criticisms of the public school today is that the instruction and training it furnishes does not measure up to current needs—that practice is not given in searching for and in grappling with the problems of society that now confront us.[9] This need is not lost sight of in this study, although the criterion can not be invoked as frequently in the introductory course as it can be in the regional studies in later courses.

7. *The criterion of possible utilization for professional subject matter in a course for teachers'-college students.*[10] The major objective of this study is that of demonstrating a method of selecting and evaluating materials to be included in introductory geography for teachers'-college students. The implied questions are meant to suggest the concepts that all the teachers of geography in the elementary school, the junior high and the teachers' college, combined, might wish

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[8]"Home geography develops accurate, vivid, concrete mental concepts obtained, in large measure, by first hand observation and investigation. These studies . . . have their chief value in making the pupil familiar with his own local environment. The better the pupil understands his home region, the sounder will be his comprehension of distant regions. . . . Comparison and contrast of distant regions with the home locality and with each other facilitate the acquisition and mastery of fundamental geographic concepts and the development of an accurate and vivid image of the earth as the home of man." *Ridgley, Geographic Principles,* page 42.

[9]"If our pupils are to grow into an adequate citizenship, they must with increasing age and with due regard to their growing outlook and interest become increasingly familiar with the problems of civilization. A proper study of 'frontier' thinkers should give us the necessary knowledge of the more important social problems likely in some form or other to confront the rising generation." *Kilpatrick, Education for a Changing Civilization,* page 77.

[10]"What are the implications of the professional attitude? The answer must be found in the needs of the service.

"1. Now as in the beginning, familiarity with the actual materials to be taught must be placed first. . . .

"2. The professional education of teachers involves not merely the extending of intellectual controls of the field of knowledge, but such extensions as are most pertinent to the teacher's problems and the social purposes of education. . . .

"3. The professional attitude will lead to searching out 'the conditions of the learner' and the adaptation of instruction to it in such a way as to leave with the learner deposits of technique for future use." *Randolph, The Professional Treatment of Subject-Matter,* pages 128-129.

to include in a series of composite lists on just one phase of the course, namely, *Land Features of the Earth as Related to Man's Interest and Activities*. Of course, the lists include much more than can be taught in an introductory course. But a rating of the implied questions by a large number of competent judges is meant to bring out which the most important are, and at the same time is expected to indicate which are relatively unimportant. For these reasons, the lists have been expanded quite beyond the number that any teacher will expect to present in the elementary or junior-high school, and at the same time easily provide a closely related margin beyond—a margin that all teachers of geography should acquire in their introductory course in a teachers' college.

The Implied Questions as Related to the Criteria

The criteria used in validating the implied questions were included on the instruction sheets sent to the judges who did the rating. This was necessary in order that they be informed as to the assumptions and point of view of the study and that all judges approach the task of rating with the same purpose.

A casual inspection of the implied questions might lead one to think that some of them do not measure up to the validating criteria. A concept of relationship, in order to be geographic, should stand the test imposed by two or more of the criteria. There are, for instance, three different combinations of conditions in which the first three criteria are involved.

Case 1: The concepts involved in implied question No. 98 (Why roadways often follow river valleys) plainly involve man's interests (Criterion No. 1), natural environmental conditions (Criterion No. 2), and a direct first-step relationship (Criterion No. 3). The involved concepts, therefore, qualify as geographic as measured by the first three criteria and in addition satisfy the demands of some of the other criteria. A large number of the implied questions introduce concepts of this type.

Case 2: The concepts involved in implied question No. 54 (How streams of my community secure their supply of water) in the first-step relationship do not involve man's interests and activities (Criterion No. 1), and, therefore, seem at first to be purely physiographic. But immediately when the first-step relationship is satisfied, man's interests at a second or third step removed from the original concept may appear in many ways—domestic water supply and health, irrigation and crops, water power and manufacturing, and navigation and trade. For this reason the involved concepts are considered important in this study and the implied question on this basis, therefore, qualifies for a place. Other of the criteria are operative also in the concepts associated with this implied question. A very large number of concepts introduced by the applied questions are of this type.

CASE 3: The concepts involved in the implied question, "Why Indiana can have better schools than North Dakota," seem at first not to involve all of the first three criteria. In the first step the relationship appears wholly social—schools (Criterion No. 1), taxation (Criterion No. 1), and relationship (Criterion No. 3). But when we get into the second or third step removed from the concepts directly involved, it at once becomes apparent that natural environment (Criterion No. 2) is operative in numerous ways—difference in population-density and amount of wealth, accounting for difference in money available, and these conditions in turn falling back into natural environmental factors for their explanation. For this reason the underlying concepts may have important implications and the implied questions on this basis are therefore included in this study. Some of the other criteria also are operative in the involved concepts just discussed. Only a few of the concepts introduced by the implied questions are of this type.

CRITERIA FOR THE SELECTION OF THE JUDGES[11]

1. *The criterion of direct interest in teacher training in geography.* It is assumed that those who teach introductory courses in geography in teachers' colleges are especially interested in and competent to judge the importance of the implied questions that were included in the lists. For this reason, teachers of geography in thirty teachers' colleges were secured to rate the implied questions.

2. *The criterion of direct interest in the teaching of geography to children in the elementary and junior-high schools.* It is assumed that teachers who have had some special training in geography and who are in intimate contact with the problems of teaching the subject to children know first hand what the children's geographic needs and interests are, and at the same time are able to assess the positive values in their own training and to realize their own deficiencies.

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[11] "The reliability of the ratings is a matter of such vital concern that large numbers of tests were made throughout the study. The results all confirm the statement that twenty-five returns are sufficiently reliable. . . . In fifteen cases the ratings computed for a random sample of twenty-five returns taken from one professional group were correlated with the ratings computed from another random sample of twenty-five taken from the same group. The mean coefficient of correlation between the fifteen samples of twenty-five each was $0.931 \pm .004$. That the ratings made by one set of twenty-five agree so completely with the ratings made by any other set of twenty-five persons representing the same professional group is one highly important indication of reliability. . . .

"This high statistical reliability is due to two facts: first, that each rating in the table represents an average of the ratings made by at least twenty-five persons; and second, each person in a given professional group agrees rather closely with each of the other members of the group in his evaluation. . . . It is therefore assumed that the ratings given in the tables represent reliable and consistent judgments by the various professional groups selected." *Charters and Waples, The Commonwealth Teacher-Training Study,* page 28.

For these reasons twenty-three elementary and junior-high-school teachers, each of whom had taken a year or more of college geography, were secured to rate the implied questions.[12]

Geographic Distribution of Judges

The trained teachers of geography in teachers' colleges who did the judging represent twenty-five states and thirty institutions. The elementary and junior-high-school judges who rated the implied questions represent fifteen states.

Each of the fifty-three judges checked each of the three hundred sixty implied questions twice—once as to *importance of the concepts* suggested, and once as to the *possibilities of illustrating the involved concepts either in miniature or in reality out-of-doors in the home area.* In all there were 38,160 separate evaluations that the investigator had to summarize and interpret.

In every case the ratings were made by those who were sufficiently interested to volunteer their services as judges. In all eighty sets of implied questions were sent out, and fifty-three responses were returned. This may be considered an excellent response, inasmuch as an average of about three hours of hard work was represented in each rating.

Table I shows the geographic distribution of the judges.

Summarizing the Ratings

The A, B, C and D values assigned to the three hundred sixty implied questions by each of the fifty-three judges were tabulated, in order to know definitely just how many A's, B's, C's, and D's each implied question received.

Likewise, the number of checks each implied question received as to possibilities of illustration in the home area was tabulated.

For the self-correlation it was necessary to tabulate the ratings by teachers in teachers' colleges into two groups of fifteen each. It was necessary also to tabulate the rating of the elementary and junior-high-school teachers into two groups—fifteen in the first and eight in the second.

How these ratings were transmuted into percentages and classified into percentile groups is explained in the next two chapters.

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[12] It is interesting to note in the lists of *Implied Questions Concerning Rivers and Associated Features* that no item rated below 50 per cent by the elementary and junior-high-school teachers was rated above 50 per cent by the college teachers, and that only four items rated 50 per cent or above by the college teachers were rated below 40 per cent by the elementary and junior-high-school teachers (See Tables III and VIII). So close is the agreement between the two groups, that the investigator felt justified in using only the judgment of the college teachers in selecting the materials for the typical unit outlined in Chapter VI.

TABLE I

GEOGRAPHIC DISTRIBUTION OF JUDGES

State	Number of Teachers'-College Judges	Number of Elementary and Junior-High-School Judges
Alabama	1	
Arkansas		1
Arizona		1
California	1	
Connecticut	2	
Idaho	1	
Illinois	1	1
Iowa		3
Kansas	1	
Kentucky	2	
Louisiana	1	
Maryland		1
Massachusetts	1	
Minnesota	1	2
Mississippi	1	
Missouri		1
Montana	1	
Nebraska	2	1
New Jersey	1	1
New York	2	2
North Dakota	1	
Ohio	1	1
Pennsylvania	2	1
Rhode Island	1	
Tennessee	1	
Texas	1	
Utah		2
Virginia	1	
Washington	1	2
West Virginia	1	
Wisconsin	1	
Wyoming		1
TOTALS	30	23

CHAPTER III

AN INTERPRETATION OF THE RATINGS RELATIVE TO IMPORTANCE

Reducing the Ratings Relative to Importance to a Percentage Basis

In order to reduce the ratings to a percentage basis so that comparisons could be made and understood easily, the rating symbols A, B, C, and D were each weighted with a numerical value. The assigning of a numerical value was a very important matter, because the distribution of each implied question on the percentage scale was involved. Since the ratings as a rule ran high, the assigning of low values to the rating symbols crowded the items into the upper half of the percentage scale.

It was assumed to be desirable that those implied questions that were assigned the A value by one-half or more of the judges should fall on the upper half of the percentage scale. It was found that this was approximately what happened when A, B, C, and D were weighted with the values 100, 10, 1, and 0, respectively. Moreover, this weighting made calculating the simpler, because the whole was thrown into a decimal system. For instance, when the summary of thirty raters gave a certain implied question 18 A's, 7 B's, 3 C's, and 2 D's, the 18 A's represented 1,800, the 7 B's represented 70, the 3 C's represented 3, and the 2 D's represented 0. This meant the total weighted summary was $1,800 + 70 + 3 + 0$ or 1,873. Since the weighted summary would be 3,000 if all of the thirty judges rated A, then the summary rating for the above implied question reduced to a percentage basis should be 1,873 divided by 3,000, which is 0.624 or 62 per cent.

In this manner the percentage importance of each implied question was determined. No item with a high B-rating could gain a 50 per cent or higher without at the same time having at least a 14 A-rating.

The Self-Correlation in the Teachers-College Group of Judges

The summarized returns from the first fifteen judges in departments of geography in teachers' colleges were correlated with the corresponding summaries from the second fifteen in the same group of judges.[1] The Pearson Product-Moment Coefficient of Correlation

[1] *Charters and Waples, Commonwealth Teacher-Training Study*, pages 70-72.

(Pearson "r") for the paired judgments on the three hundred sixty implied questions was .778 ± 0.014. The means were 65.9 per cent and 58.1 per cent, respectively, with standard deviations of 20.9 per cent and 22.2 per cent. The coefficient of correlation is more than fifty times the probable error. This is much more than is necessary for high reliability.[2]

Moreover, a correlation of .778 indicates that there is a comparatively high agreement among teachers of geography in teachers' colleges as to what the most important materials are for an introductory course in geography for teachers'-college students.

The means are significant in showing that the first half of the group rated the implied questions 7.8 per cent higher than the second half did. The investigator does not know why this happened. It is true that in the first half there was a much larger proportion of men than in the second half. It may be that those who sent in their ratings first had more enthusiasm for the task. But it is difficult to see wherein either of these differences would be significant.

The standard deviation in the ratings of the first half of the group was 1.3 per cent less than that of the second half. This would seem to indicate that the two halves of this group of judges place approximately the same relative interpretation on the rating symbols, although the members of the first group were inclined to rate somewhat higher.

Self-Correlation in the Teachers'-College Group with Scatter Diagrams Relative to the Implied Questions Used for the Typical Unit of Work

On the ninety-five implied questions used for the typical unit in Chapter VI, the ratings by the first fifteen judges were correlated with the second fifteen. The correlation coefficient was .852 ± 0.05. The means were 60.8 per cent and 50.5 per cent, respectively, and the standard deviations were 23.4 per cent and 21.6 per cent. (See Figure 1.)

When the thirty ratings were arranged in the numerical sequence in which they were returned and the odds were correlated with the evens, the correlation coefficient was .86 ± 0.02. The means were 55.2 per cent and 56.6 per cent, respectively, and the standard deviations were 23.9 per cent and 20.9 per cent. (See Figure 2, page 25.)

The mean for the first fifteen was about 10 per cent higher than for the second fifteen, which suggests that the members of the first group probably were more enthusiastic for the materials and for the task than were the members of the second group. The mean for the odds differed from the mean for the evens by 1.4 per cent, which of

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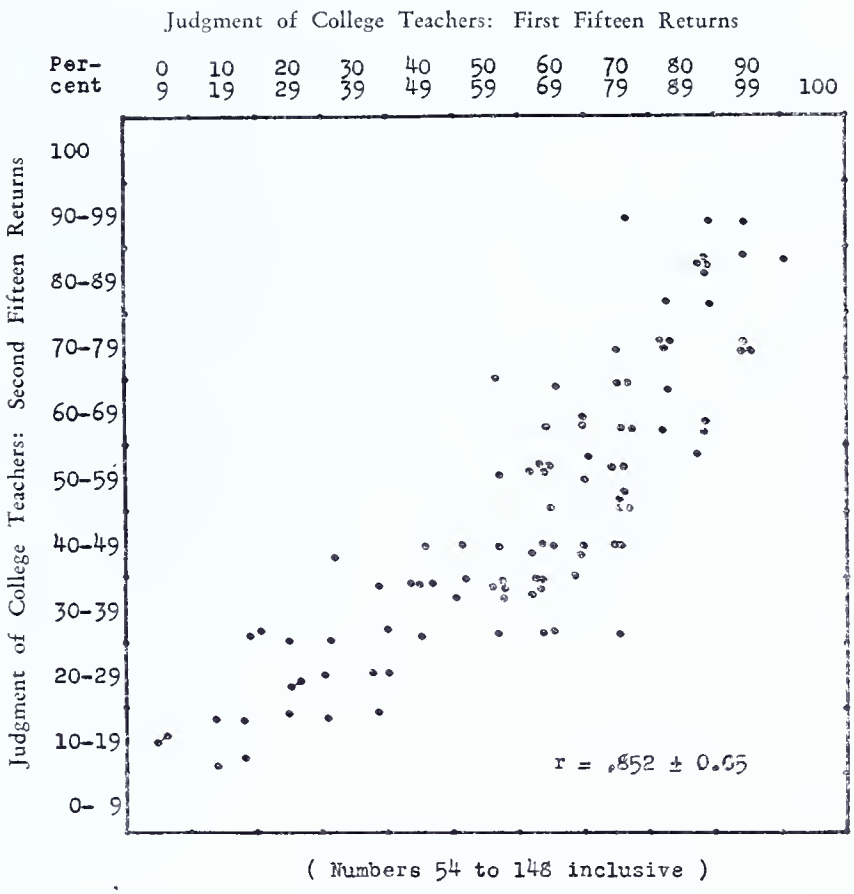
[2]*Garrett, Statistics in Psychology and Education,* page 170.

course was to be expected. The fact that the standard deviations in the two correlations differ but little, and that the correlation coefficients were almost identical points to a high degree of consistency and agreement among the judges.

FIGURE 1

SCATTER DIAGRAM SHOWING SELF-CORRELATION OF JUDGMENTS RELATIVE TO THE IMPORTANCE OF CONCEPTS SUGGESTED BY THE IMPLIED QUESTIONS



THE SELF-CORRELATION IN THE TRAINED ELEMENTARY AND JUNIOR-HIGH-SCHOOL GROUP OF JUDGES

The returns from the first fifteen judges teaching in the elementary and junior-high schools, when summarized and reduced to a percentage basis, were correlated with the next eight returns from the corresponding group. The Pearson "r" for the paired judgments on the three hundred sixty implied questions was .721 $\pm$ 0.0171. The

means were 55.6 per cent and 68.2 per cent, respectively, with standard deviations of 23.3 per cent and 22.46 per cent. The coefficient of correlation is more than forty times the probable error. This is much more than is required for high reliability.

A correlation of .721 indicates that there is a large measure of agreement among elementary and junior-high-school teachers as to what the important materials are that should be taught at these grade levels. The difference between the means might be less if there were more judges in the second group. The small difference between the standard deviation seems to indicate that the judges were placing approximately the same relative values on the rating symbols.

Correlation Between Teachers'-College Judges and Those of the Elementary and Junior-High Schools

The college teacher of geography from the point of view of this study is concerned primarily with the training of teachers of geography for the elementary and junior-high schools. This means, of course, that the prospective teacher must know or learn especially well the materials he may be called upon to teach and also a comfortable margin of related material beyond this utilitarian minimum.

The teacher of geography in the elementary and junior-high school knows especially well the interests and capacities of children. His experience has indicated wherein his preparation is strong and wherein deficient. It is rather to be expected that his rating of the implied questions will average lower than that of the college teacher. But the agreement of the two groups, as a whole, is quite remarkable.

The coefficient of correlation for the paired ratings of these two groups of judges on the three hundred sixty implied questions is $.831 \pm 0.011$. The means are 62.3 per cent and 60.3 per cent, respectively, and the standard deviations are 20.11 per cent and 21.13 per cent.

The correlation coefficient is more than seventy-five times its probable error. This is more than is necessary for high reliability. The difference between the means is just 2 per cent and between the standard deviations a little over 1 per cent. These figures seem to indicate a high measure of agreement between the two groups of teachers as to the relative importance of the three hundred sixty implied questions and the geographic concepts they suggest.

A Typical Scatter Diagram of the Correlated Ratings of Teachers'-College Judges and Those of the Elementary and Junior-High School

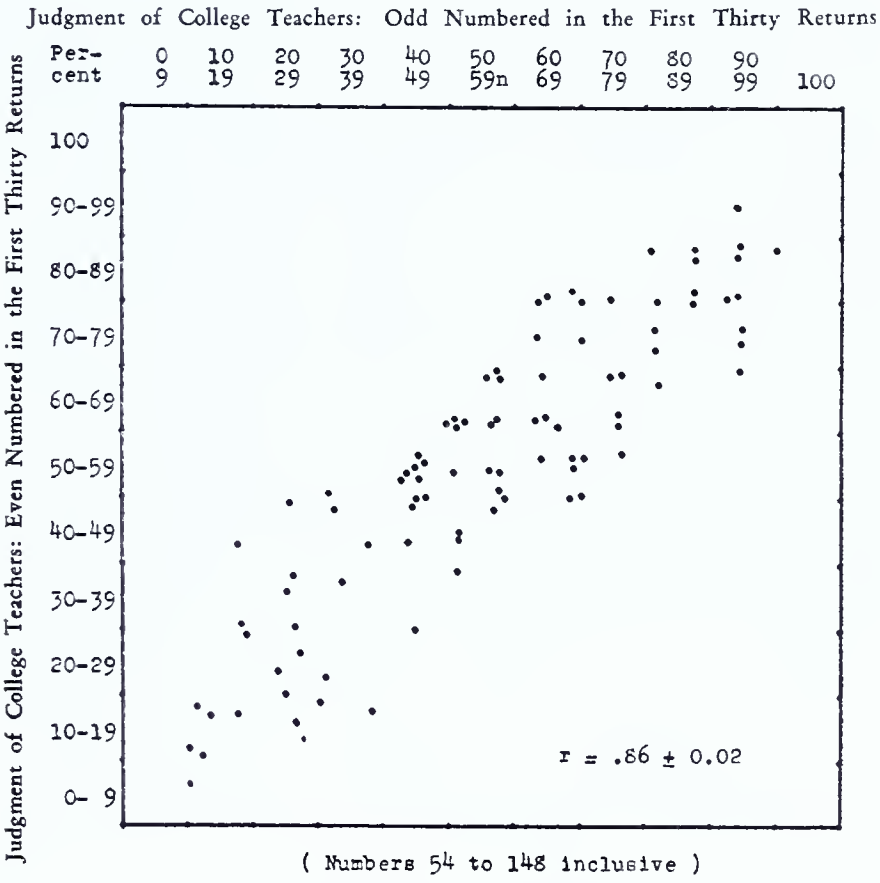
The scatter diagram pictures the correlation of the judgments of the two groups of raters on the ninety-five implied questions in the group entitled "Implied Questions Concerning Rivers and Their Asso-

ciated Features." The Pearson "r" in this case is 0.806 ± 0.0242 with a mean of 56.4 per cent for the teachers'-college judges and 53.5 per cent for the elementary and junior-high-school judges. The standard deviations are 21.1 per cent and 22.6 per cent, respectively.

The lower standard deviation for the college teachers means that there may be a little closer agreement among them as to the importance of the implied questions than there is among the public-school teachers of geography. The higher mean for the college teachers indicates that they place a higher average value on the importance of

FIGURE 2

SCATTER DIAGRAM SHOWING SELF-CORRELATION OF JUDGMENTS RELATIVE TO THE IMPORTANCE OF CONCEPTS SUGGESTED BY THE IMPLIED QUESTIONS



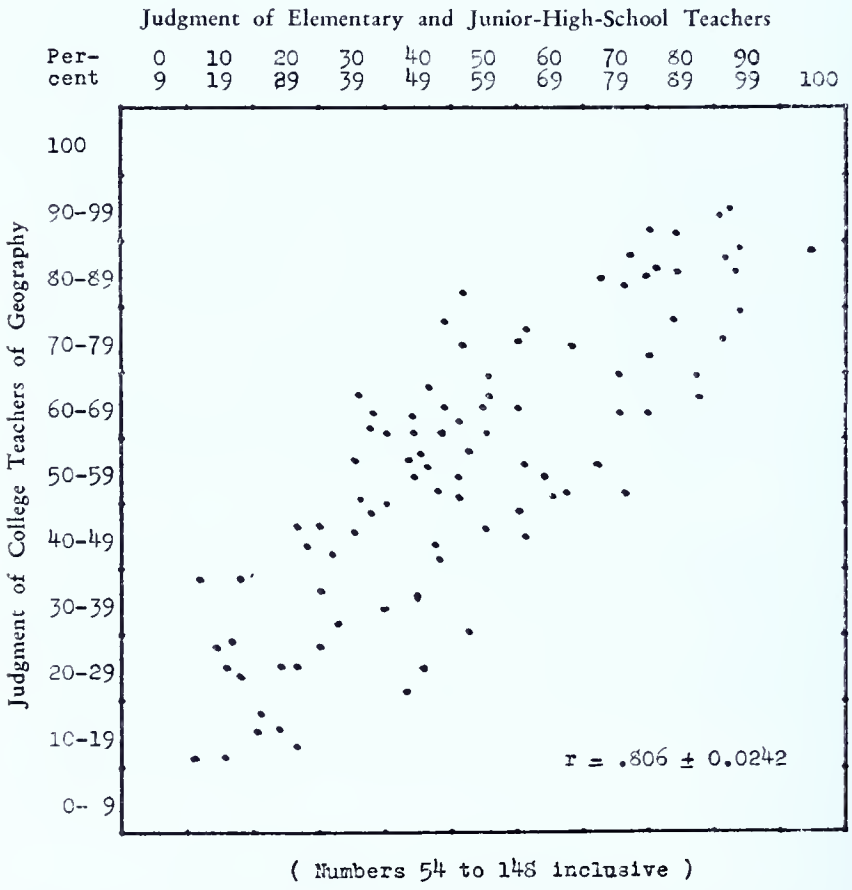
the implied questions than do the elementary and junior-high-school teachers. The high correlation means that, although the college teachers rate the items a little higher than do the elementary and

junior-high-school teachers, yet the judgments of the two groups quite consistently parallel each other.

The small difference in the means may be accounted for in part by remembering that the point of view of the two groups of judges may be biased by the relative capacity of the two groups taught. Although the two groups judged the items according to the same directions, the child as an immediate factor no doubt loomed large in the minds of the elementary and junior-high-school teachers whereas the capacity

FIGURE 3

SCATTER DIAGRAM SHOWING SELF-CORRELATION OF JUDGMENTS RELATIVE TO THE IMPORTANCE OF CONCEPTS SUGGESTED BY THE IMPLIED QUESTIONS



of the prospective teacher no doubt was a large factor in the minds of the college teachers of geography. So this small difference in the means was to be expected.

The group of implied questions represented on the scatter diagram (Figure 3) are the ones used in the organization of the typical unit of work set up in Chapter V.

The Implied Questions Classified as to Importance

It was found, when the composite ratings had been summarized and transmuted into percentages by the arbitrary weightings employed, that the implied questions scored all the way from 100 per cent to less than 10 per cent. This was to be expected, because the investigator did not presume when he made up the lists to know how to differentiate between the implied questions that should be included in the course and those that should be excluded. The placing of each implied question in the classified lists depended not on the judgment of the investigator but on the composite rating by the chosen judges.

In the tables which follow, no implied question ranks 50 per cent or higher unless it was scored A by one-half or more of the judges. (Out of the three hundred sixty implied questions there were ten exceptions to the above in the lists rated by the teachers'-college judges —ten cases in which the item received one A less than half. But in each case there were ten or more B's, which, according to the weighting technique employed, gave the item the equivalent of another A.)

The numbers in the classification tables correspond to the numbers of the implied questions in the lists sent out to the judges (See Appendix B). For instance, in Table II the five (5) indicates that implied question No. 5 in the rated lists was given an A evaluation by all thirty judges. The rating for No. 5 placed it in the percentile step headed 100.

The thirteen (13) in Table II means that implied question No. 13 in the rated lists received 15 A's, 11 B's, 4 C's, and 0 D's. The weighting technique used places it in the 50 to 59 percentile step.

No. 29 was given 14 A's, 13 B's, 3 C's, and 0 D's. The weighting technique placed it in the 50 to 59 percentile step (See explanation in paragraph in parentheses above).

RELATIVE IMPORTANCE OF IMPLIED QUESTIONS AND INVOLVED CONCEPTS AS JUDGED BY THIRTY TEACHERS OF GEOGRAPHY IN TEACHERS' COLLEGES

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1 I. HUMAN ACTIVITIES, INTERESTS AND EXPERIENCE AS RELATED TO THE NATURAL ENVIRONMENT

TABLE II

2 A. Introductory Implied Questions Concerning the Uses Made of the Land in My Community

Average Importance in Per Cent (Numbers 3 to 51)										
	99	89	79	69	59	49	39	29	19	9
100	90	80	70	60	50	40	30	20	10	0
5	3	7	4	14	13	8	6	26		
		17	10	20	19	9	11	34		
		18	16	21	28	15	12			
		23	32	22	29	25	37			
		30	35	24	31	27	45			
		33	40	42	36	49	47			
		38	41	46						
		39	43	50						
			44	51						
			48							

TABLE III

52 II. Land Features of the Earth as Related to Man's Interests, Activities and Experience

53 A. Implied Questions Concerning Rivers and Associated Features

Average Importance in Per Cent (Numbers 54 to 148)										
	99	89	79	69	59	49	39	29	19	9
100	90	80	70	60	50	40	30	20	10	0
	78	74	54	56	60	57	67	72	71	
	88	77	55	62	61	65	80	82	127	
	115	89	58	66	63	83	81	84	130	
	118	94	59	73	64	103	102	91	131	
		98	68	75	69	104	125	92	138	
		112	79	76	70	106	128	116	139	
		113	97	86	85	108	142	117		
		114	99	95	87	109		141		
		119	136	96	90	110		147		
		121	137	100	93	122				
		135		101	111	124				
				105	123	145				
				107	126	146				
				120	143					
				129	148					
				132						
				133						
				134						
				140						
				144						

TABLE IV

149 B. Implied Questions Concerning Plains and Their Uses

Average Importance in Per Cent (Numbers 150 to 204)										
	99	89	79	69	59	49	39	29	19	9
100	90	80	70	60	50	40	30	20	10	0
193	153	154	158	152	150	155	156	157		
	166	167	159	162	151	163	161	165		
	178	183	160	169	171	164	200	177		
	179	188	182	170	173	168		189		
	180	194	191	172	190	175				
	184	196	195	174	197	202				
	186	198		176	201					
	187	199		181						
	192	204		185						
	203									

TABLE V

205 C. Implied Questions Concerning Hilly and Rugged Lands and Their Uses

Average Importance in Per Cent (Numbers 206 to 317)										
	99	89	79	69	59	49	39	29	19	9
100	90	80	70	60	50	40	30	20	10	0
	225	219	214	206	209	216	211	220	207	208
	226	227	217	210	212	221	224	234		
	244	241	218	213	222	228	235	236		
	252	245	223	215	229	232	281	275		
	253	248	239	230	240	233	286	302		
	272	249	243	231	242	237	310	303		
	287	250	254	246	263	238	312			
		251	257	247	268	304	313			
		259	258	255	276	308				
		271	260	256	280					
		273	261	265	283					
		282	262	266	284					
		288	264	267	285					
		293	269	274	291					
		295	270	278	294					
		300	277	290	298					
		311	279	292	307					
		314	289	296	316					
			301	297						
				299						
				305						
				306						
				309						
				315						
				317						

TABLE VI

318 D. Implied Questions Concerning Inland Waters and Their Uses

Average Importance in Per Cent (Numbers 319 to 367)										
	99	89	79	69	59	49	39	29	19	9
100	90	80	70	60	50	40	30	20	10	0
	346	329	320	319	330	332	322	326	340	
	348	335	321	334	338	361	324	331		
	350	337	323	339	345	365	325	341		
	356	352	327	342			328	355		
	357	360	333	343			364			
	358	363	336	344						
	367	366	349	347						
			354	351						
			362	353						
				359						

RELATIVE IMPORTANCE OF IMPLIED QUESTIONS AND INVOLVED CONCEPTS AS JUDGED BY TWENTY-THREE ELEMENTARY AND JUNIOR-HIGH-SCHOOL TEACHERS

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1 I. Human Activities, Interests and Experience as Related to the Natural Environment

TABLE VII

2 A. Introductory Implied Questions Concerning the Uses Made of the Land in My Community

Average Importance in Per Cent (Numbers 3 to 51)										
	99	89	79	69	59	49	39	29	19	9
100	90	80	70	60	50	40	30	20	10	0
	17	3	4	13	9	6	46	8		
	18	30	5	22	14	10		11		
		39	7	23	21	12		26		
		41	16	31	24	15		34		
		51	20	32	25	19		45		
			33	36	28	27				
			35	40	29					
			38	43	37					
			44	50	42					
			48		47					
					49					

TABLE VIII

52 II. Land Features of the Earth as Related to Man's Interests, Activities and Experience

53 A. Implied Questions Concerning Rivers and Associated Features

Average Importance in Per Cent (Numbers 54 to 148)										
	99	89	79	69	59	49	39	29	19	9
100	90	80	70	60	50	40	30	20	10	0
89	59	54	61	60	55	66	57	71	82	
	74	73	62	63	56	67	81	84	91	
	78	76	90	68	58	69	104	106	92	
	88	77	101	70	64	72	105	110	117	
	98	79	112	86	65	83	108	127	125	
	135	113	119	97	75	87	109	138	130	
	136	114	121	137	80	95	116	139	131	
		115		145	85	96	122	141	142	
		118		146	93	99	124			
		129		148	94	100	128			
					107	102	132			
					134	103	143			
					140	111	144			
						120				
						123				
						126				
						133				
						147				

TABLE IX

149 B. Implied Questions Concerning Plains and Their Uses

Average Importance in Per Cent (Numbers 150 to 203)										
	99	89	79	69	59	49	39	29	19	9
100	90	80	70	60	50	40	30	20	10	0
	178	153	154	152	150	155	189	157	156	
	186	166	158	159	151	161	200	168	165	
	187	167	162	160	170	173		177		
	192	180	174	163	171	175				
	193	181	179	164	172	195				
	198	184	183	169	176					
	203	191	188	182	197					
		199	190	185						
		204	194	201						
			196	202						

TABLE X

205 C. Implied Questions Concerning Hilly and Rugged Lands and Their Uses

Average Importance in Per Cent (Numbers 206 to 317)										
	99	89	79	69	59	49	39	29	19	9
100	90	80	70	60	50	40	30	20	10	0
253	225	210	206	211	228	216	221	220	207	208
	241	212	209	215	238	275	224	237	234	
	259	227	213	218	246	281	233	286	236	
	300	239	214	226	247	283	235	310		
		245	217	229	262	284	294	313		
		250	219	230	266	285	296			
		251	222	232	268	297	303			
		252	223	240	276	302	307			
		256	231	242	280	312				
		260	244	243	282	316				
		271	249	248	292					
		272	254	261	298					
		273	255	263	304					
		287	257	265	308					
		306	258	267						
		311	264	277						
		314	269	279						
			270	289						
			274	290						
			288	291						
			293	299						
			295	309						
			301	317						
			305							
			315							

TABLE XI

318 D. Implied Questions Concerning Inland Waters and Their Uses

Average Importance in Per Cent (Numbers 319 to 367)										
100	99 90	89 80	79 70	69 60	59 50	49 40	39 30	29 20	19 10	9 0
	333	319	329	320	327	330	322	324	340	
	346	334	337	321	328	365	325	341		
	348	344	338	323	331		326	355		
		347	342	335	332			364		
		352	345	336	362					
		356	349	339						
		358	350	343						
		359	353	351						
		367	354	361						
			357	363						
			360							
			366							

Interpretation to Be Placed on the Classified Lists of Implied Questions

In the directions for rating, the judges were instructed to assign an A value ("very important") to all implied questions which involved concepts that the prospective teacher might be called upon to teach in the elementary or junior-high school. According to the composite rating, therefore, we may be sure that all items in the classified lists having a score of 50 per cent or more are "very important"—very important because each implied question received an A-rating or higher by one half or more of the judges.

The directions for rating instructed the judges to assign a B value ("important") to all implied questions which the prospective teacher should know because they involved concepts that were closely akin to but probably beyond that which he would be called upon to teach in the elementary or junior-high school. According to the weighting employed, therefore, an implied question given a perfect score of B values by the judges would receive a 10 per cent in the classified lists.

All of the implied questions falling below 50 per cent in the tables were assigned A values by less than one-half the judges, and B, C and D values in such proportions as to put them in their particular places in the table.

The tables, therefore, on the basis of relative importance, rank the implied questions in each group along with their involved concepts into ten percentile steps. These lists and steps may be consulted by the teachers of geography in teachers' colleges when outlining their

introductory courses in geography. The lists and steps should be useful in such cases because they represent a consensus of opinion as to the relative importance of certain subject-matter materials.

The implied questions represented by the numbers in the tables also may serve as a check list for both teachers and students in estimating how well the teaching has been done and how well the students have mastered the subject matter of the course.

The implied questions represented in Table III are the ones that furnish the basis for Chapters V and VI.

CHAPTER IV

AN INTERPRETATION OF THE RATINGS RELATIVE TO THE POSSIBILITIES OF ILLUSTRATING THE INVOLVED CONCEPTS IN THE HOME AREA

Reducing the Ratings to a Percentage Basis

In reducing the ratings to a percentage basis it was necessary only to divide the actual rating by the highest possible rating. For instance, when thirty judges are employed, the highest score any implied question could receive would be thirty. The actual score, say eighteen, divided by thirty would give a rating of .60, or 60 per cent.

In this manner, the percentage possibility of illustrating the concepts suggested by each of the implied questions either in miniature or in reality out-of-doors in the home area was determined.

Meaning of High and Low Ratings

Any implied question rating high, say 75 per cent or above, certainly involved concepts that could be illustrated either in miniature or in reality out-of-doors in almost any region. Even when an implied question rated as low as 20 per cent or 25 per cent, certain judges were able to see possibilities for illustrating that perhaps others had not recognized. It is probably true, then, that in cases where only a small percentage of the judges recognized illustrative possibilities of the kind called for, that every geography teacher should search diligently for such opportunities.

The Self-Correlation in the Teachers'-College Group of Judges

The realization that certain of the geographic concepts involved in the implied questions can be illustrated either in miniature or in reality out-of-doors in the home area is impressed on the minds of teachers by the collective opinion of competent judges. In order that collective opinion be acceptable, however, it should be shown to what extent the competent judges agree in their opinions.

The returns from the first fifteen judges in departments of geography in teachers' colleges were correlated with the corresponding

returns from the second fifteen. The coefficient of correlation for the paired judgments on the three hundred sixty implied questions with their associated concepts was .826 $\pm$ 0.0113. The means were 47.7 per cent and 39.8 per cent, respectively, and the standard deviations were 27.3 per cent and 26.2 per cent.

The correlation of .826 indicates that there is a large measure of agreement among teachers of geography in teachers' colleges as to the possibilities of illustrating basic concepts in the home area—the concepts involved in the implied questions. The correlation coefficient is more than seventy times the probable error. This is much more than is required for high reliability.

Self-Correlation in the Teachers'-College Group of Judges on the Implied Questions Used for the Typical Unit of Work

On the ninety-five implied questions used for the typical unit in Chapter VI, the ratings by the first fifteen judges were correlated with the ratings by the second fifteen with a resulting coefficient of .74 $\pm$ 0.03. The means were 66.3 per cent and 54.3 per cent, respectively, and the standard deviations were 19.7 per cent and 18.9 per cent.

When the thirty ratings were arranged in the numerical sequence in which they were returned and the odds correlated with the evens the coefficient was .68 $\pm$ 0.04. The means were 54.6 per cent and 67.5 per cent, respectively, and the standard deviations were 16.5 per cent and 17.6 per cent.

The correlation of the ratings of the first half of the judges and the second half seems to follow the pattern of the ratings for importance shown on page 23, although the correlation coefficient is lower. However, when the results between the odds and evens are considered in connection with the results between the first fifteen and the second fifteen, a large amount of consistency and agreement is not apparent. In fact, the results seem erratic.

The investigator, therefore, is inclined to rely much more on Tables II to VI than he is on Tables VII to XI.

Self-Correlation in the Trained Elementary and Junior-High-School Group of Judges

The returns from the first fifteen judges teaching in the elementary and junior-high schools were summarized and reduced to a percentage basis, after which they were correlated with the next eight returns from the same group. The coefficient of correlation for the paired judgments on the three hundred sixty implied questions was .84 $\pm$ 0.0105. The means were 31.6 per cent and 39.6 per cent, respectively, and the standard deviations 23.43 per cent and 28.31

per cent. The coefficient of correlation is eighty times its probable error. This is more than is necessary for high correlation.

A coefficient of correlation of .84 indicates that there is a large measure of agreement among elementary and junior-high-school teachers as to the possibilities of illustrating certain of the involved concepts either in miniature or in reality in the home area.

The Correlation Between the Teachers'-College Judges and Those of the Elementary and Junior-High Schools

It is to be expected that teachers of geography in teachers' colleges have greater freedom in taking their students for out-of-doors work than do elementary and junior-high-school teachers. The maturity and wider experience of their students enable them to make a more definite and diversified use of objective experience. A summary of the ratings of the two groups seems to verify these assumptions.

The coefficient of correlation for the paired ratings of these two groups of judges relative to the possibilities of illustrating the involved concepts out-of-doors in the home area was $.845 \pm 0.010$. The means were 41.2 per cent and 34.2 per cent, respectively, and the standard deviations were 28.9 per cent and 24.62 per cent.

In general, the agreement of the two groups as measured by the coefficient of correlation is significantly high. The higher mean for the college teachers seems natural when the possibilities of the two groups for out-of-doors work is taken into consideration.

A Typical Scatter Diagram of the Correlated Ratings of Teachers'-College Judges and Those of the Elementary and Junior-High School

The scatter diagram (Figure 4) pictures the correlation of the judgments of the two groups of raters relative to the possibilities of illustrating either in miniature or in reality out-of-doors in the home area the concepts represented by the ninety-five items in the group entitled "Implied Questions Concerning Rivers and Their Associated Features". The coefficient of correlation for these paired ratings was $.82 \pm 0.0227$ with an average of 50.1 per cent for the college group and 45.6 per cent for the public-school group. The standard deviations were 38.1 per cent and 22.8 per cent, respectively.

The concepts of relationships stated in Chapter V and those used in the typical unit of work in Chapter VI are the same as the ones represented on the scatter diagram.

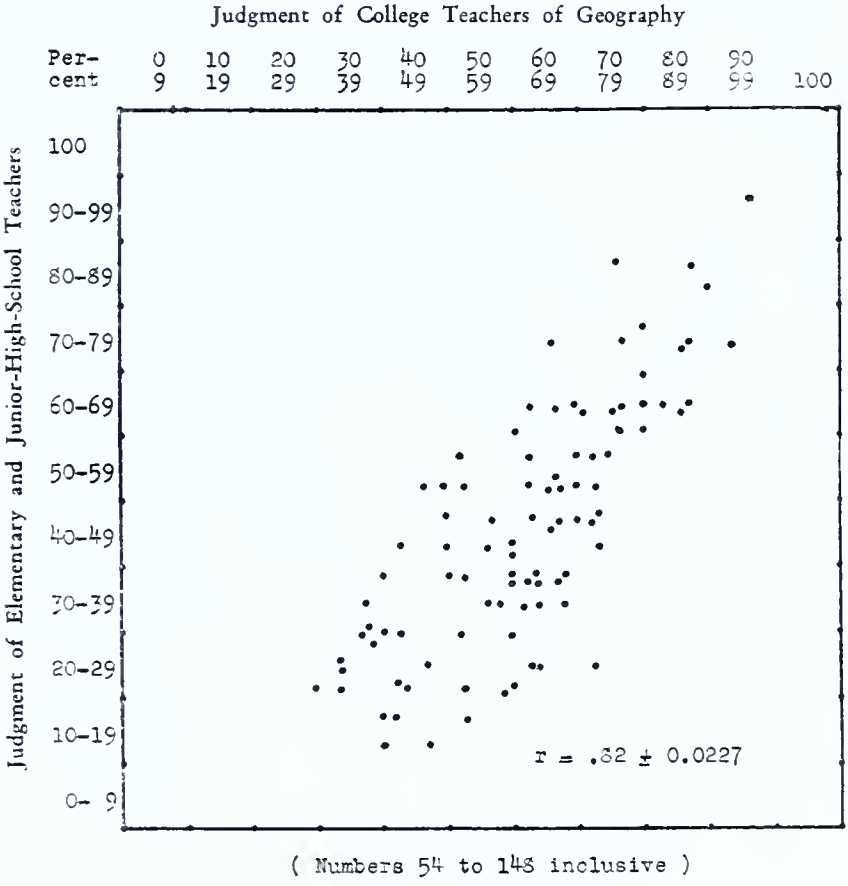
The Implied Questions Classified as to Possibilities of Illustrating the Involved Concepts in the Home Area

When the ratings of the three hundred sixty implied questions were summarized as to the possibilities of illustrating the suggested geo-

graphic concepts in the home area it was found that the percentage scores ranged all the way from 100 per cent to 0 per cent. Of course, this was to be expected because certain of the implied questions were

FIGURE 4

SCATTER DIAGRAM SHOWING CORRELATION OF JUDGMENTS RELATIVE TO THE POSSIBILITIES OF ILLUSTRATING SUGGESTED CONCEPTS IN THE HOME AREA



of such a nature that they held no possibilities of being illustrated anywhere in our country.

It seems that both college teachers and teachers in the public schools recognized their greatest opportunities in the home areas for illustrating concepts in connection with rivers and their associated features.

The college group of judges rated more than three-fourths of these items above 50 per cent and only two items fell below 30 per cent.

The public-school group did not recognize such large opportunities, however, for only two-fifths of the items rated above 50 per cent and one-fifth fell below 30 per cent.

It seems fair to assume that, when any implied question rated 30 per cent or higher, teachers are likely to find possibilities for illustrating the suggested concepts in almost any area.

POSSIBILITIES OF ILLUSTRATING IN THE HOME AREA CONCEPTS SUGGESTED BY THE IMPLIED QUESTIONS AS JUDGED BY THIRTY TEACHERS OF GEOGRAPHY IN TEACHERS' COLLEGES

1 I. Human Activities, Interests and Experience as Related to the Natural Environment

TABLE XII

2 A. Introductory Implied Questions Concerning the Uses Made of the Land in My Community

Possibilities of Illustrating Suggested Concepts in the Home Area Averages Given in Per Cent (Numbers 3 to 51)										
	99	89	79	69	59	49	39	29	19	9
100	90	80	70	60	50	40	30	20	10	0
3	7	9	8	12	6	37	11			
4	13	16	10	20	26	45	50			
5	14	17	15	28	29	49	51			
33	23	18	19	39	36					
	24	22	21	41	42					
	32	25	27	44	47					
	35	38	30	46						
		40	31	48						
			34							
			43							

TABLE XIII

52 II. Land Features of the Earth as Related to Man's Interests, Activities and Experience

53 A. Implied Questions Concerning Rivers and Associated Features

Possibilities of Illustrating Suggested Concepts in the Home Area Averages Given in Per Cent (Numbers 54 to 148)										
	99	89	79	69	59	49	39	29	19	9
100	90	80	70	60	50	40	30	20	10	0
	55	54	59	58	69	57	82	141		
	56	61	60	63	87	71	117			
	137	74	62	64	102	72	125			
		76	66	65	103	84	128			
		77	68	67	104	85	145			
		96	73	70	105	86	147			
		97	88	75	107	116	148			
		98	91	78	108	127				
		118	92	79	109	130				
		123	93	80	113	131				
			100	81	122	134				
			114	83	135	138				
			119	89	142	139				
			121	90	144	146				
			124	94						
			129	95						
			136	99						
				101						
				106						
				110						
				111						
				112						
				115						
				120						
				126						
				132						
				133						
				140						
				143						

TABLE XIV

149 B. Implied Questions Concerning Plains and Their Uses

Possibilities of Illustrating Suggested Concepts in the Home Area
Averages Given in Per Cent (Numbers 150 to 204)

	99	89	79	69	59	49	39	29	19	9
100	90	80	70	60	50	40	30	20	10	0
	150		153	152	156	164	151	159	161	
			162	154	157	178	155	173	166	
				160	158	179	163	183	167	
				187	186	203	165	193	174	
					188		168	194	175	
							169	196	181	
							170	197	190	
							171	198	192	
							172	199	195	
							176		201	
							177		202	
							180			
							182			
							184			
							185			
							189			
							191			
							200			
							204			

TABLE XV

205 C. Implied Questions Concerning Hilly and Rugged Lands and Their Uses

Possibilities of Illustrating Suggested Concepts in the Home Area Averages Given in Per Cent (Numbers 206 to 317)										
	99	89	79	69	59	49	39	29	19	9
100	90	80	70	60	50	40	30	20	10	0
		206		209	214	213	207	218	208	224
					215	235	210	223	212	233
					216	241	211	225	227	292
					217	252	219	226	230	298
					249	259	220	237	231	299
					268	269	221	243	232	306
						271	222	244	234	317
							228	246	238	
							229	247	239	
							236	248	240	
							245	250	242	
							251	256	255	
							253	260	257	
							254	261	258	
							270	263	262	
							272	265	264	
							273	278	266	
							307	279	267	
							309	282	274	
								283	275	
								284	276	
								287	277	
								288	280	
								289	281	
								295	285	
								300	286	
								304	290	
								310	291	305
									293	308
									294	311
									296	312
									297	313
									301	314
									302	315
									303	316

TABLE XVI

318 D. Implied Questions Concerning Inland Waters and Their Uses

Possibilities of Illustrating Suggested Concepts in the Home Area Averages Given in Per Cent (Numbers 319 to 367)										
	99	89	79	69	59	49	39	29	19	9
100	90	80	70	60	50	40	30	20	10	0
		319	320	323	327	321	322	324	337	349
		329	330	331	338	325	346	335	339	351
			333	332	344	326	354	336	348	
			345		347	328	356	340	355	
					361	334	362	341	358	
						342	363	352	364	
						343		353	365	
						350		357		
						359				
						360				
						366				
						367				

POSSIBILITIES OF ILLUSTRATING IN THE HOME AREA CONCEPTS SUGGESTED BY THE IMPLIED QUESTIONS AS JUDGED BY TWENTY-THREE ELEMENTARY AND JUNIOR-HIGH-SCHOOL TEACHERS

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1 I. HUMAN ACTIVITIES, INTERESTS AND EXPERIENCE AS RELATED TO THE NATURAL ENVIRONMENT

TABLE XVII

2 A. Introductory Implied Questions Concerning the Uses Made of the Land in My Community

Possibilities of Illustrating Suggested Concepts in the Home Area Averages Given in Per Cent (Numbers 3 to 51)										
	99	89	79	69	59	49	39	29	19	9
100	90	80	70	60	50	40	30	20	10	0
3	32	7	17	9	6	20	8	11		
4	33	16	25	10	12	22	21	49		
5	35	18	30	13	46	26	37			
		23	31	14		42	45			
		24	34	15		47	48			
		38	39	19		51	50			
			41	27						
				28						
				29						
				36						
				40						
				43						
				44						

52 II. Land Features of the Earth as Related to Man's Interests, Activities and Experience

TABLE XVIII

53 A. Implied Questions Concerning Rivers and Associated Features

Possibilities of Illustrating Suggested Concepts in the Home Area
Averages Given in Per Cent (Numbers 54 to 148)

	99	89	79	69	59	49	39	29	19	9
100	90	80	70	60	50	40	30	20	10	0
	55	76	54	61	58	63	64	57	72	
		136	56	66	59	67	65	81	127	
		137	62	68	60	69	71	82	130	
			74	70	73	86	75	84	131	
			77	80	78	87	79	111	141	
			83	96	88	91	85	112	142	
			98	97	90	92	89	114		
				118	93	94	95	116		
				119	101	99	108	117		
				120	103	100	109	138		
				121	105	102	110	143		
				123	107	104	113	144		
				129	115	106	122	148		
					146	124	125			
							126			
							128			
							132			
							133			
							134			
							135			
							139			
							140			
							145			
							147			

TABLE XIX

149 B. Implied Questions Concerning Plains and Their Uses

Possibilities of Illustrating Suggested Concepts in the Home Area Averages Given in Per Cent (Numbers 150 to 204)										
	99	89	79	69	59	49	39	29	19	9
100	90	80	70	60	50	40	30	20	10	0
			150	186	153	157	151	168	159	166
			162		154	158	152	169	165	167
					160	187	155	170	172	175
						191	156	173	174	176
							161	177	179	195
							163	178	181	201
							164	180	182	202
							171	184	183	204
								188	185	
								189	192	
								190	193	
								196	194	
								197	198	
								200	199	
									203	

TABLE XX

205 C. Implied Questions Concerning Hilly and Rugged Lands and Their Uses

Possibilities of Illustrating Suggested Concepts in the Home Area
Averages Given in Per Cent (Numbers 206 to 317)

	99	89	79	69	59	49	39	29	19	9	
100	90	80	70	60	50	40	30	20	10	0	
		206		210	213	207	209	224	218	208	
					235	214	211	225	219	212	
						252	215	236	220	231	
						269	216	237	222	233	
						301	217	238	223	234	
							221	241	230	239	
							226	251	232	240	
							227	253	246	242	
							228	254	250	243	
							229	256	264	244	
							245	260	265	247	
							249	270	275	248	
							259	272	279	255	
							268	273	280	257	
							271	282	284	258	
								283	285	261	
								300	287	262	
								302	288	263	
								306	303	266	
								309	304	267	296
									308	274	297
									310	276	298
										277	299
										278	305
										281	307
										286	311
										289	312
										290	313
										291	314
										292	315
										293	316
										294	317
										295	

TABLE XXI

318 D. Implied Questions Concerning Inland Waters and Their Uses

Possibilities of Illustrating Suggested Concepts in the Home Area Averages Given in Per Cent (Numbers 319 to 367)										
	99	89	79	69	59	49	39	29	19	9
100	90	80	70	60	50	40	30	20	10	0
	329			320	366	319	321	324	322	340
						345	323	326	337	347
							325	328	339	348
							327	331	354	349
							330	332	355	353
							333	334	358	365
							335	338	362	
							336	341	363	
							343	342	364	
							344	346		
							350	352		
							351	356		
							359	357		
							360	361		
								367		

CHAPTER V

SOME CONCEPTS OF RELATIONSHIPS SUGGESTED BY THE IMPLIED QUESTIONS

How the Implied Questions May Suggest Concepts of Relationships

The nature of geography and of geographic concepts were discussed in Chapters I and II. In those chapters considerable stress is placed on the importance of relationships in geographic study. The first three criteria used in validating concepts were emphasized especially in their bearing on a study of geographic relationships.

In the section dealing with *Implied Questions as Related to the Criteria*, it was shown how concepts of relationship may evolve from the implied questions. It must be remembered that the human element is not always apparent in the first-step relationship. But if it turns out that the concept involved in the question helps in the understanding of a relationship between human activities and natural environment in a second or third step removed, then it is considered important as far as this study is concerned.

This chapter presents the investigator's attempt to state in tentative form only some of the important concepts of relationships involved in the implied questions in the classified list dealing with *Rivers and Associated Features*. The variable nature of the elements entering into geographic relationships makes a complete and final statement of such concepts very difficult and in fact precarious. Half truths are too often accepted as whole truths and final. Error, prejudice, superstition and fear thrive on statements of relationships that do not take all of the elements of a situation into account. The geographer, therefore, is very cautious in his statement of geographic relationships, because no one knows better than he the errors that have been fostered by misconceived notions concerning the interactions and interrelations of man and his areal home.

In the following statements of relationships, therefore, it must be understood that no claim of completeness or finality is to be imputed to the investigator. In fact, each statement should be carefully studied to learn wherein it is adequate, and wherein it falls short of complete veracity. In a period when everyone is so conscious of rapidly shifting values, practice in this type of thinking by children as well as by prospective teachers is most wholesome.

A geographic concept is a creation of the human organism (mind) and as a rule is associated with words. For this reason, the technical

vocabulary of geography should be developed if possible in an atmosphere of objectivity. But the degree to which any new geographic concept is appreciated and understood depends in a large measure on the nature and richness of the experience carried by the individual into the situation.

Children with limited experience ordinarily cannot come out of a geographic situation with as rich and comprehensive meanings (concepts) as can adults. Geographic concepts grow in meaning as ever more and more of related experience is incorporated into the reconstructed patterns of thought. This principle of intellectual growth furnishes the basis for the differing degrees of complexity of expression and varying use of geographic vocabulary in the following tentative statements of concepts of relationship.

In the statements following the implied questions no attempt has been made to give a complete answer. In some cases a complete answer might be possible, whereas in others it would be impossible. However, the statements given are meant to contribute significantly to the reconstruction of patterns of thought suggested by the implied questions.

The sequence in which the implied questions and associated concepts appear in the list has nothing to do with their relative importance. The concepts of facts and things as defined in Chapter II do not appear in this list. The implied question in each case appears in italics, and the associated concept or concepts of relationship are stated immediately thereafter.

Some Concepts of Relationships Involving Rivers and Associated Features

**56.[1] *Why some streams of my community carry more water than others do*

The volume of water carried by streams (other factors thought of as constants)[2] varies directly with the amount and intensity of the rainfall, the steepness of the slope, and the size of the drainage basin, and inversely as the porosity of the mantle rock and the depth of the water table.

The complex statement of relationship given above may be broken up into a series of simplified concepts of relationship, each of which contains two major items, one of which in each case involves the amount of water carried by streams. The

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[1] The numbers of the implied questions here correspond to the numbers in the original lists (See Appendix B).

[2] In each statement of concepts of relationships it is understood that related outside factors are to be held constant, that is, "other things being equal".

** The double starred (**) implied questions and associated concepts represent the *very important* materials, having been rated A by one-half or more of the judges. Probably these will be taught in the elementary or junior-high school.

first four (a, b, c and d), are statements of direct relationship, and the other two (e and f), are statements of inverse relationship.

a. The greater the amount of rainfall the greater the volume
b. The greater the intensity of rainfall the greater the volume
c. The greater the drainage basin the greater the volume
d. The steeper the slopes the greater the volume
d. The steeper the slopes the greater the volume
f. The deeper the water table the less the volume

NOTE: The converses of the above statements are assumed to be true also.

Although each of the above concepts expresses a natural-to-natural relationship, it is evident that each is involved in the cultural-to-natural relationship called for in such implied questions as Numbers 59, 77, 78, 99, 113, etc.

It is evident that many of the complex statements of relationship following the implied questions in this chapter can be broken up into a series of simpler statements. It is assumed that the sample given above is sufficient for the purposes of this study. For a method of developing concepts of relationships, see Chapter VI, pages 83 to 84.

57. *What relation ground water bears to the volume of streams*

The volume of water carried by streams varies directly with the depth to which the channel extends into the saturated zone of ground water, and the porosity of the materials enclosing the channel.

**58. *Why some streams of my community are intermittent*

The constancy of flow of streams depends on the frequency, type and amount of rainfall, the depth of the channel, the area and contour of the catchment basin, the nature of the soils and structure of the underlying mantle and bedrock, the slope of the land, the nature of the vegetation cover, and the extent to which man interferes with environing conditions.

**59. *How the volume of a stream may affect its usefulness*

The volume of a stream is often an important factor in assessing its usefulness. (Associated with this concept among other things are power, irrigation, transportation and recreation. In order to get more exact statements of relationship it would be necessary to analyze the word *usefulness* into specific items of usefulness.)

**63. *What the factors are that affect the amount of load a stream can carry*

The amount of load a stream can carry depends upon its velocity, its temperature, its chemical nature, its depth and the nature of the materials.

65. *What the factors are that affect the rate at which a stream may deposit its load*

The concepts associated with this implied question are similar to those state in (63).

**66. *Why the water in a stream may not be equally clear at all times*

The turbidity of a stream depends on its velocity, the nature of its load, its temperature, its chemical nature, the materials of the channel, the nature of the precipitation, and man's activities within the area.

67. *Why river deposits differ so much in degree of fineness*

The relative texture of stream deposits varies directly with the velocity.

**69. *Why some streams are always muddy and others are clear*

The concepts associated with this implied question are similar to those given in (66).

72. *Factors involved in the rate at which streams may lower or build up the surface of the land*

The rate at which streams may lower the surface of the land depends on the velocity, volume, the nature of the materials through which it flows, the steepness of the slopes, the vegetation cover, and the nature of human activities in the area.

**73. *Why streams build alluvial plains, deltas and alluvial fans*

Streams build alluvial plains, deltas and alluvial fans in places where they are forced to drop their loads.

**74. *Why valleys are usually more fertile than adjacent hilly lands*

Erosion in part varies directly with the slope of the land.

Deposition by streams carrying a load depends in part upon a decreased velocity.

Erosion removes fertile soil from hilly lands, and this is often deposited in adjacent valleys.

**75. *How the texture of river deposits may affect their usefulness*

The texture of any given soil is a large factor in the use that may be made of it. (Associated with this concept among other things are various types of farming, sand and gravel for commercial purposes, and the distance to market.)

**77. *What some of the economic effects of the streams in my community are*

Man depends on streams in part to drain the land, to furnish power, water supply, transportation, irrigation, recreation and fishing, and to carry sewage and other refuse materials away. (The term, *ecenomic effects,* needs to be analyzed into its elements.)

Streams, even small ones, often interpose barriers to transportation, communication and travel.

**78. *Why some streams are more valuable for power, or irrigation, than others*

The value of a stream for power varies with its volume, gradient, constancy of flow, possibilities for storage in the drainage basin and adjacent needs.

The value of a stream for irrigation depends on adjacent needs, constancy of supply, volume, gradient, and possibilities for storage in the drainage basin.

**79. *Why locks and canals are sometimes necessary in river valleys*

Locks and canals tend to be constructed in rivers where obstructions to navigation are found and where streams need to be connected at portages near their headwaters.

**85. *How glaciers may modify stream courses*

Continental glaciers tend to modify stream courses by the uneven deposition of drift (ground moraine).

Valley glaciers modify stream courses by excessive erosion in their valley floors.

**86. *How glaciation may make waterfalls*

Continental glaciers often create conditions favorable to the making of waterfalls by directing streams into new channels.

Valley glaciers often create waterfalls by the making of hanging valleys (Yosemite Falls).

**87. *How streams make and destroy waterfalls, rapids and cataracts*

Streams tend to create waterfalls and rapids by differential erosion, and to destroy them by eventually eroding away the obstructions.

**88. *How waterfalls may help or hinder man's activities*

Waterfalls may furnish power-sites for human use.

Waterfalls may interpose an effective barrier to the navigation of large streams.

**89. *How falls affect navigation*

Waterfalls in streams often interpose barriers to navigation which are overcome only by expensive canals and locks.

**90. *What the conditions are that favor the building of dams in streams*

Narrow or constricted valleys with rocky valley walls and floors often furnish the most favorable sites for dams.

There is a tendency to build dams in streams where there is great need for power or irrigation water.

**94. *How valley widening may modify man's use of the land*

Lateral erosion by streams in their valleys tends to interfere with the building of roadways and railways along valley sides and with agricultural activities in their alluvial plains.

**95. *How valley making may interfere with man's use of the land*

Valley making (gullying) on cultivated land interferes with man's interests and activities. (Associated with this concept is the loss of surface soil, interference with farm operations, and decreased soil fertility.)

See (94) also.

**96. *Evidence that the streams of my community are even now modifying the area through which they flow*

Covered in part by (63), (66), (67), (69), (72), (73), (87), (94) and perhaps others.

**97. *How the work of the streams of my community modifies the activities and interests of the people*

Covered in part by (59), (65), (66), (69), (72), (73), (74), (75) and others.

**98. *Why roadways often follow valleys*

Streams tend to develop valleys with nearly uniform gradients.

**99. *What conditions favor the flooding of valleys*

Rivers with low gradient and meandering channels are frequently subject to destructive flooding.

**100. *Why slow-moving streams are frequently subject to flooding*

Water in slow-moving streams during periods of maximum flow tends to accumulate in the valleys.

**101. *How to prevent disastrous floods in the alluvial plains of some rivers*

Flooding in valleys varies inversely with the gradient and directly with the sinuosity of the channel. (Some other factors

are shape of valley, nature, size and direction of tributaries, vegetation in the catchment basin, storage lakes and reservoirs in their courses and depth of channel.)

102. *Why slow-moving streams usually have winding courses*

The capacity of a stream to move or remove obstacles in its course varies directly with the sixth power of its velocity.

Slow-moving streams tend to follow lines of least resistance.

103. *Why streams meander*

Closely related to (102).

104. *How sinuosity affects the length of a river*

The length of a stream varies directly with its sinuosity.

**105. *How meanders affect drainage and transportation*

The drainage rate of a stream varies inversely with its sinuosity.

The rate of transportation on rivers varies inversely with its sinuosity.

**107. *How to make shallow and shifting rivers more navigable.*

The navigability of rivers varies directly with the stability and depth of their channels.

109. *Why distributaries are associated with deltas and alluvial fans*

The accumulation of alluvial and deltaic deposits at the mouths of streams tends to develop distributaries.

110. *Why the distributaries over deltas and alluvial fans often have shifting courses*

As distributaries gradually but surely choke their channels with detritus, they tend to change their courses.

**111. *How human interests and activities in some places I have seen have been affected by aggrading or by degrading streams*

The gullying work of streams and the building of alluvial fans, deltas and alluvial plains have a tendency to affect human interests and activities in many ways. (See some of the preceding concepts.)

**112. *What makes alluvial plains, alluvial fans and deltas valuable*

The nearly level character of the land, and frequently the high quality of the soils, tend to make alluvial fans, alluvial plains and deltas desirable for human occupancy.

**113. *Why living on deltas and alluvial plains is often precarious*

The possibility of flooding on some alluvial plains and deltas tends to make living on them dangerous.

**114. *Where the most favorable places in valleys are for the location of towns and cities*

Cities and towns tend to develop at breaks in transportation in valleys. (Associated with this concept are (a) great bends, (b) valley and river junctions, (c) entrance to large navigable water bodies, (d) falls and rapids, (e) shallow places in the stream, and (f) other places where the valley route crosses other routes.)

**115. *Why many river valleys are good for human habitation*

Easy transportation by land and water, favorable soil and topography, availability of water supply for domestic and irrigation purposes, and general attractiveness, tend to invite human occupancy into many river valleys.

**119 *How population distribution and movements in my community have been influenced by land forms*

The distribution of people in any given area tends to adjust itself to land forms.

**120. *How a stream may make the land more rugged*

The capacity of a stream to make the land more rugged or less rugged depends in part on its velocity, volume, the nature of the mantle rock of the area, and the cover of vegetation.

Streams increase or decrease the ruggedness of an area by differential erosion.

**121. *How excessive erosion may be retarded or stopped*

Erosion by running water gradually may be retarded or stopped by progressively decreasing its velocity, by diverting the water into new channels, or by improving the vegetation cover.

122. *How streams may make the land smoother*

The concepts associated with this implied question are corollary to those of (120).

**126. *How human activities in some places I have seen are adapted to different stages of topographic development*

Human activities and interests tend to develop differently on various types of topography. (Associated with this concept are young, mature and old mountains, plains and valleys.)

**133. *How the age of a valley affects its usefulness to man*

In general, the usefulness of valleys to man varies directly with their stage of (maturity) development.

**134. *How valleys are related to the history of a region*

In new countries the cultural development of the lands has tended in many instances to follow the river valleys.

**135. *Why pioneer trails often made use of water gaps*

Routes of travel through rugged lands tend to follow the easy gradients made by streams.

**140. *What the factors are that affect the velocity of a stream*

The velocity of a stream in general varies directly with the gradient and depth and inversely with the amount of load.

142. *Comparative gradient in different parts of the course of a normal stream.*

In normal streams, the gradient varies directly with the distance from the mouth toward the source.

**144. *How the stage of maturity of a river affects human activities associated with it*

Recreation and manufacturing tend to become associated with young streams.

Agriculture and transportation tend to become associated with mature and old streams.

145. *Why streams in arid regions usually have steep banks, precipitous valley walls, and, as a rule, few tributaries*

The erosive power of streams flowing through arid regions tends to spend itself largely in deepening the channel.

146. *Why, as a rule, mountain valleys are narrow and deep, and plains valleys shallow*

The concepts associated with this implied question are very similar to those of (120).

**148. *Why we may expect rivers to become more and more useful to man*

The usefulness of streams varies directly with man's increasing ingenuity in devising ways of making them work for him.

CHAPTER VI

A TYPICAL UNIT OF PROFESSIONAL CONTENT MATERIAL

The Professional Subject-Matter Treatment

It is not within the province of this study to discuss at length rival theories of presentation as applied to geographic subject matter. The historical development of the whole problem of professional treatment of content material, including the various contrasting theories as applied to the liberal-arts tradition and the teacher-training movement, has been admirably traced by Randolph.[1] His study, his recommendations, and his suggested applications have pointed the way for recent endeavors in the more comprehensive attempts to organize various types of subject-matter materials with reference to their professional treatment.

A number of other writers have discussed the general theory of professional treatment of subject matter from various angles.[2] These discussions are very illuminating and on the whole have added in large measure to a better understanding of present needs.

Two workers, Cross[3] and Schaaf,[4] have made notable contributions in their particular fields of interest. The former has prepared a course in the "Fundamentals of English" for teachers'-college students, which has been developed according to the professional subject-matter treatment. The latter has prepared and organized the materials for a course in junior-high-school mathematics for teachers'-college stu-

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[1] *Randolph, The Professional Treatment of Subject-Matter,* Baltimore, 1924.

[2] *Bagley, What is Professional Subject-Matter? New York Society for the Experimental Study of Education, Proceedings of:* 155-156, 1928.

Evenden, The Critic Teacher and the Professional Treatment of Subject-Matter. A Challenge, Educational Administration and Supervision, Volume 15: 373-382, 1929.

Miller, Alaska (A Type of Professionalized Subject Matter), Journal of Geography, Volume 27: 45-63, 1928.

Fries, The Problem of Professionalized Subject-Matter, Education, Volume 48: 145-162, 1927.

Lewis, The Professionalization of Subject Matter as a Trend in Teachers College Development, Peabody Journal of Education, Volume 6: 325-332, 1929.

Upton, The Teacher's Course in Arithmetic in the Normal School, Teachers College Record, Volume 27: 92-123, 1925.

[3] *Cross, Fundamentals in English.* Macmillan and Company, New York. 1926.

[4] *Schaaf, A Course for Teachers of Junior High School Mathematics,* New York, 1928.

dents, the outline of which indicates that the author has adhered closely to the professional factors laid down by Randolph, Cross and others.

The following are the professional factors which serve as criteria for the organization of Schaaf's material on junior-high-school mathematics.[5] In each of his units of work this outline stands out prominently.

A. Teacher's Knowledge of the Topic
B. Appreciation Background
C. Educational Values
D. Teaching Objectives
E. Psychological Considerations.
F. Teaching Procedures

The investigator in this study finds that the criteria set up by Schaaf in developing *A Course for Teachers of Junior High School Mathematics* are well adapted to the organizing of a unit of work on *Rivers and Associated Features* for a course in introductory geography for teachers'-college students. In general harmony, therefore, with the point of view of advocates of the professional treatment of subject matter for teachers'-college students, the investigator has developed a unit of work for introductory geography.

An Outline of the Professional Factors Applied to a Unit of Work on Rivers and Associated Features

The professional factors involved in the training of teachers includes the subject matter, the prospective teacher, and the child. In this study the ninety-five rated implied questions dealing with *Rivers and Associated Features* represent the subject matter utilized as the basis for the illustrative unit of work. It is the purpose of the study at this point to indicate some of the professional factors that should be taken into consideration in putting the subject matter into the possession of the prospective teacher and through him passed on to elementary and junior-high-school pupils.

The six professional factors as applied to the unit of work on *Rivers and Associated Features*, therefore, should be understood in their broader implications before the actual materials are taken up for consideration with the college students.

1. The teacher's knowledge about the unit should include:
   a. Those materials he may be called upon to teach to children in the elementary and junior-high schools concerning rivers and associated features. According to the judgment of thirty teachers of geography in teachers' colleges, this should cover the materials involved in all implied questions of the unit rating 50 per cent

[5] Ibid, p. 7.

or higher (See page 29 and Directions for Rating, page 106). These implied questions have been organized into problem form for teaching purposes.

b. Those materials which may be considered a comfortable margin of knowledge closely related to, but probably beyond what he will be called upon to teach in the elementary or junior-high school. The judgment of thirty teachers of geography in teachers' colleges indicates that all the implied questions with a rating between 10 per cent and 50 per cent probably should be included in the marginal materials (See page 29 and Directions for Rating, page 106). In the major problem the implied questions involving the marginal materials are starred—those rating between 19 per cent and 50 per cent having a single star (*) and those below 20 per cent a double star (**).

c. Those materials dealing with the learning processes and the techniques of teaching which are intimately associated with the subject matter of the unit. This includes particularly those factors in the learning process which seem to justify the principle of objectivity in the acquisition of basic concepts, and the preferable techniques and sequences in which materials should be presented. These factors are applicable in the reconstruction of the experience of children as well as of adults. Therefore, the college student by investigating the way he himself learns, is expected to discover some of the principles to be applied in organizing material for elementary and junior-high-school levels (See assumptions in Chapter I).

2. The background materials the teacher should know or acquire about rivers and associated features may include:

a. Personal experience in the home region or elsewhere concerning rivers and associated features. This background material becomes useful especially when the college student comes into contact with these features in the local field study. A large number of the implied questions involve the organizing and reconstructing of experience and patterns of thought around the local area. Such studies are expected to generate enthusiasm in the prospective teacher for this type of work and also indicate to him what some of the possibilities are along this line for his work in the elementary and junior-high school. Actual practice in planning exercises for teaching should be offered to the college student.

b. Historical development of peoples in the valleys and along the rivers of Egypt and Iraq. This may be extended to include as much of riparian civilization as time permits. The prospective teacher should be afforded an opportunity to develop lesson plans which include the relations between the activities of some ancient peoples and the river valleys in which they lived. Im-

plied questions Nos. 134 and 135 rated high and involve materials here indicated.

c. The historical significance of rivers and associated features in connection with the explorations and development of the United States. This might include the tidal rivers along the eastern coast, the great rivers leading to the interior and the significance of the many minor streams in any part of the country. The correlation of the work in United States history in the junior-high school with the geography of rivers and associated features affords large opportunities for the prospective teacher to try his ability in planning exercises of this type. Implied questions Nos. 98, 114 and 135 each rated above 80 per cent in importance and are representative of materials apropos to this situation.

3. The values of the materials of the unit in the education of the individual are indicated or implied in:

a. Some of the basic principles and assumptions of Chapter I. It is the business of the college teacher in this professional course to keep the student aware of these principles and assumptions as the work on the unit goes forward (See especially pages 6 to 9), not only as the student applies these principles to his own needs, but also as he may be called upon to apply them in the teaching of children.

b. The criteria in general set up and explained in Chapter II. The college teacher in this course should strive to make his students professionally minded toward geographic subject matter. In order to do this the materials of the course must be checked constantly in the light of the principles and assumptions stated in Chapter I and the criteria for selecting subject matter set up in Chapter II. The prospective teacher looking to the future should be able to see children reacting more intelligently and more effectively toward life situations, because of the merits of the geographic materials that have been organized into their patterns of thought and action.

c. The criterion of relationships in particular (See page 15). This criterion calls attention to the essential unity of human knowledge which is fostered especially by a study of the relationships between human interests, activities and achievements on the one hand, and natural environmental conditions on the other. Geography, therefore, emphasizes the close relationships existing between the natural and the social sciences. The students in this course should be kept aware of this educational value of the unit, not just to the point of intellectual assent, but they should be imbued with enthusiasm for the actual potentialities for good in the lives of children of a study of environmental relationships. About sixty-seven of the implied questions deal with environmental relationships, and of these, twenty-nine deal with

cultural-to-natural items. Through a study of relationships of this type, children are introduced to many of the vital problems of people relative to the use of rivers and associated features.

4. The teaching objectives built up from the criteria and assumptions in Chapters I and II associated with this unit of work include:

   a. The general objectives, which, when organized into a unified whole, may be thought of as constituting major geographic understandings concerning rivers and associated features professionally interpreted. These objectives involve the college-teacher's broad, inclusive point of view relative to the geographic materials and the professional attitude he hopes to cultivate in the prospective teacher. Through them he envisages the end products of his teaching, namely, intellectually enlightened and socially minded children in the elementary and junior-high schools. The following are the general objectives:

      (1) To encourage students to investigate and see the streams and associated features of the local area as they affect the activities and interests of the people.

      (2) To see that students secure a working knowledge of both concepts of facts and concepts of relationships as illustrated by the streams and associated features in the local area.

      (3) To help students in applying the concepts learned to a few regions outside the home area in order to gain facility in application through practice and to appreciate the value of seeking for wider applications or extensions of the meanings that they acquire.

      (4) To help students to develop new concepts by the reconstruction of experience with geographic elements outside of the local area.

      (5) To encourage students to use the implied questions in developing concepts of relationship.

      (6) To help students to develop a sense of the outstanding part that streams have played and still are playing relative to the interests and activities of people.

      (7) To encourage students to search for some of the major crucial problems of the present day that involve the streams and associated features of the local area and of some of the great rivers of the world.

      (8) To encourage the prospective teacher, as far as he is able, to survey the subject-matter material of the unit in the light of a modern philosophy of education, in which a general overview of the whole social and educational situation may be taken into account.

   b. The specific objectives which are comprehended definitely in the major problem, associated minor problems, and the implied

questions as reorganized into problem form. The specific objectives put the student into definite, daily contact with the larger implications of the unit of work, both academic and professional. The many details called for by the ninety-five implied questions are gradually taught and learned, and systematically organized through the unifying influence of the basic assumptions of the study and the major problem.

5. The psychological elements involved in the unit are pretty thoroughly covered, actually or by implication, in Chapter I. At this point it is necessary only to call attention to the principles and assumptions on pages 6 to 9, more especially (1), (2), (3) and (6). Psychological considerations are involved more or less in attacking the problem in each of its various phases, namely, the finding of the major integrating centers, the pre-tests, the observational field work, the teaching tests, the laboratory work with the physiographic diagram of the local area, the class discussions, the oral and written summaries in which the student tries his ability in the stating of geographic concepts of relationships, a study of some of the crucial present-day problems connected with rivers and associated features, the final comprehensive statement of the major understandings involved in the unit and the evaluating of student achievement. This professional factor includes also an appraisal of the psychological elements that must be taken into account in reorganizing the subject-matter material for children.

6. The procedure utilized in teaching the unit includes:
   a. An inspection of the rated implied questions with the thought of finding the integrating centers and organizing the materials around a large problem, following, in general, the line of thought introduced on pages 13 to 18.
      (1) Materials involving concepts of facts and things:
         (a) Natural items (See Nos. 76 to 137)
         (b) Cultural items (None introduced independently)
      (2) Materials involving concepts of relationships between:
         (a) Natural items and natural items (See Nos. 56, 58 and 100)
            Both particular and generalized.
         (b) Cultural items and natural items (See Nos. 74, 98 and 114)
            Both particular and generalized.
         (c) Cultural items and cultural items (None introduced directly)
            Both particular and generalized.
      (3) Materials covering the professional factors involved
   b. A pre-test including a generous sampling of the materials covered by the ninety-five implied questions.

c. A field study in the local area to observe and tentatively interpret some of the items called for in the implied questions.
d. A completion teaching exercise dealing with the materials of the field study.
e. A laboratory exercise centered around a physiographic diagram of the local area.
f. Class discussion covering the developing and stating of typical concepts of geographic relationships.
g. Group discussions covering the materials which were organized into problem form, bringing together some statements of concepts of relationships.
h. Class discussions summarizing the work of the independent groups on the different phases of the problem.
i. Constructing an abbreviated list of crucial present-day problems involving rivers and associated features.
   (1) Crucial problems of the local area
   (2) Crucial problems of some other areas
j. A final comprehensive statement of the major understandings covering the items involved in the general objectives.
k. Evaluating student achievement to determine whether or not the essentials of the unit have been assimilated as covered by the items in the specific objectives.
l. Summary statement.

Integrating Subject Matter, Professional Factors and Teaching Technique

The teaching of a unit of professional subject matter is a more complex procedure than the teaching of purely academic material. The professional factors must be integrated with approved teaching techniques. For this reason, acceptable procedures that dominate teaching in the elementary and secondary schools may not be applicable in the teaching of a unit of professional subject matter without considerable modification.

It will be obvious to those who read this study that the "mastery formula"[6] technique dominates the procedure in the organization of this unit of work. However, the academic subject matter represented by the implied questions and the professional factors involved in the training of prospective teachers make difficult and perhaps undesirable an implicit adherence to the step-by-step procedure of the "mastery formula". In other words, each of the several steps of the Morrison procedure may not be completed when first it is taken up, but on the contrary may recur several times as the work on the unit progresses.

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[6]*Morrison, The Practice of Teaching in the Secondary Schools*, Chapter VI.

The preliminary inspection of the implied questions, the pre-test, the field study, the completion teaching exercise and the laboratory study are predominantly but not exclusively *exploratory.*

The class period in which the developing and stating of typical concepts of natural-to-natural relationships suggested by the implied questions is presented by the teacher, corresponds in large measure to the *presentation* phase of the Morrison technique. This element of the procedure is again invoked in the attack on cultural-to-natural relationships and in the introduction to crucial present-day problems.

On the field trip, in the laboratory study and in the intensive study of the materials suggested by the implied questions the *assimilative* elements of the procedure are in process. Text studies, library readings, map interpretations, and group discussions constitute a part of the work of the assimilative phase.

The discussion and *organization* of materials come, in part, in the class exercises following the assignment. As a climax to the work, corresponding to the *recitation* of the "mastery formula" procedure, the students are expected to present in terse, accurate statements the major understandings they have achieved as a result of their work on rivers and associated features.

A final comprehensive check-up test brings the work of the unit to a close. The results of the final test when compared with the results of the pre-test should disclose what has been accomplished by each student.

The reader is reminded at this point that the investigator holds no brief for the teaching procedures and techniques employed in this unit, although he does think it to be somewhat unique or unusual. He submits this as one way of integrating the implied questions, the professional factors and approved techniques in teaching into a unit of professional subject matter in geography.

Introducing the Unit of Work

The good teacher at all times desires to foster the spirit of adventure in his class. At each successive stage in the unfolding of a unit of work he may encourage his students to exercise their creative ability by proposing various routes by which their exploration into the field of geographic knowledge and of teaching procedure may go forward.

In introducing the work on streams and associated features the teacher may tell of some gripping experience he has had in connection with streams or read an experience of someone else. He may prefer to have some student or several students tell of their experiences.

If the teacher has read over the major problem and associated minor problems which follow in this chapter he will have noted that the three minor problems deal with (a) the nature of streams and associated features, (b) the effect of streams in modifying the areas through which they flow, and (c) the relations of streams and asso-

ciated features to the activities of people. Under the inspiration and guidance of the teacher the students in a cooperative group exercise may organize some of their personal experiences under these three headings. Reference at this point to section 6a, page 64, will indicate the types of questions and experiences that are most sought in this connection. It is quite essential that cognizance be taken here of this matter, because the implied questions are organized on a similar basis, and this exercise is preliminary to the introduction of the rated materials.

This method of approach with proper adaptations is one that could be used with children as well as with college students. Some teachers may wish to carry forward this procedure in introducing practically all the questions to be raised and studied concerning rivers and associated features.

The foregoing set-up is in the nature of an oral exploratory exercise, which the teacher may use in generating interest and in appraising what the students already know about the unit.[7] In cases where time is limited (and usually it is greatly limited) the desire for a short cut at this point may impel the teacher and the class to accept the general set-up of the problem as proposed in this chapter—a set-up that includes all of the ninety-five rated implied questions. Regardless of the way in which the attack is made, the desired outcome is to achieve the major objectives.

The Meaning of Major and Minor Problems

In stating the major problem it is desirable that it be broad enough to include much of the materials of the unit of study. Of course, it must be definite, clear and interesting, and these features of the problem must not be sacrificed for the sake of brevity and breadth. In attacking the problem it is desirable to break it up into its constituent elements. These elements, then, may be studied both in their separate and in their multiple relationships.

The major problem in this unit is thought of as involving three minor problems. Each of these minor problems is attacked by assembling under it the implied questions that are pertinent to its central theme. According to the system of weighting, only those implied questions receiving an A-rating by one-half or more of the college teachers secured a percentage rating of 50 per cent or more. In the problem those implied questions rating between 50 per cent and 19 per cent are starred (*), and those rating below 20 per cent are double starred (**).

Whenever a concept of relationship is involved in the implied question, reference to the corresponding item in Chapter V will give one or more tentative statements of the relationships involved, which need

[7] *Ibid*, pp. 232-243.

to be considered in following up the study. In the *Outline of the Problem,* therefore, the student is guided in the use of the implied questions in his attack on the unit of work and in the developing of concepts of relationship.

MAJOR PROBLEM

In What Ways May the Streams and Their Associated Features Within a Given Area Exert Appreciable Influences on the Interests, Activities and Achievements of the People? (Includes those implied questions rating 50 per cent or more.)

Outline of the Problem. (Involving three minor problems used in attacking the major problem.)

Minor Problem I

What are the origin and nature of streams and their associated features? (The concepts of relationship here involved are largely of the type described in Case 2, Chapter II, page 17.)

1. (76)[1] How the following stream-built features either in miniature or in reality are illustrated in my home community: Master stream or river, tributary or branch, river system, river basin, bank, right bank, left bank, meander, ponding, cut-off, oxbow, channel, course, gradient, steep gradient, uneven gradient, cut bank, shingle bank, natural levees, alluvial terraces, canyons, gorges, gullies, bayou, under-cutting, side-cutting, distributaries
2. (56) Why some streams of my home area carry more water than others do
3. *(57) What relation ground water bears to the volume of streams
4. (58) Why some streams in my region are intermittent
5. (99) What the conditions are that favor the flooding of valleys
6. (100) Why slow-moving streams are frequently subject to flooding
7. (102) Why slow-moving streams usually have winding courses
8. *(91) Why the current of a stream is fastest on the convex side of a bend
9. *(92) Why the bank is often steep on the convex side of a bend and more often low on the concave side
10. (103) Why streams meander
11. (104) how sinuosity affects the length of a river

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[1] The number in the parentheses refers to the implied question in the original lists (See Appendix B), and to the associated concepts under that number in Chapter V.

* Starred (*) items were rated between 50 per cent and 29 per cent.

12. (140) What the factors are that affect the velocity of a stream
13. *(142) Comparative gradient in different parts of the course of a normal stream
14. (68) What a river is (more than just water)
15. (93) How streams widen their valleys
16. *(81) How a stream may lengthen its valley
17. *(82) What the limits are to which a stream may lengthen its valley
18. *(83) How streams may make their valleys deeper or shallower
19. *(84) What the limits are to which a stream may fill or deepen its valley
20. *(80) How the streams of my community were made
21. (96) Evidence that the streams of my community are even now modifying the areas through which they flow
22. (54) How the streams of my community get their supply of water
23. (55) How the surface run-off water in my community gets away
24. (85) How glaciers may modify stream courses
25. (86) How glaciation may make waterfalls
26. (118) What is meant by topography
27. *(124) How to differentiate between young, mature and old topography
28. *(125) How base-leveling or peneplanation is brought about
29. *(127) How the work of reducing an area to base level may be hastened or hindered
30. *(128) What is meant by a cycle of erosion
31. (132) How young, mature and old valleys differ from one another
32. (137) How the following valley features either in miniature or in reality are illustrated in my community: Main valley, tributary valley, valley system, valley sides, young valley, mature valley, old valley, gorge, canyon, gully, valley floor, cliffs, narrows, water-gaps, alluvial plains, flood plains, underflow
33. *(108) How flood plains differ from alluvial plains
34. (136) What a valley is
35. **(138) How the age of a stream compares with the age of its valley
36. **(130) What is meant by antecedent and consequent streams
37. **(131) How trellised drainage differs from dendritic drainage
38. **(139) How the age of a stream is to be interpreted

** Double starred (**) items were rated lower than 30 per cent.

39. *(147) How streams furnish an index to the history (physiographic and geologic) of the land
40. (143) What is meant by youth, maturity and old age in connection with rivers.
41. (123) How various land features may be illustrated on an eroded slope
42. (129) How to illustrate land features on a sand table

MINOR PROBLEM II

How do streams modify the areas through which they flow? (These concepts of relationship involved in this sub-problem are largely of the type described in Case 2, Chapter II, page 17.)

1. (60) What is meant by the load of a stream
2. (61) How a stream gathers its load
3. *(65) What the factors are that affect the rate at which a stream may deposit its load
4. (66) Why the water in a stream is not equally clear at all times
5. (69) Why some streams are always muddy and others always clear
6. (63) What the factors are that affect the amount of load a stream can carry
7. (64) When a stream is overloaded
8. (61, 62) How a stream gathers, carries and disposes of its load
9. **(71) How pot-holing is carried on in river beds
10. (70) What the tools of a stream are
11. (73) Why streams build alluvial fans, deltas and alluvial plains
12. *(67) Why river deposits differ so much in degree of fineness
13. *(109) Why distributaries are associated with deltas and alluvial fans
14. *(110) Why distributaries over deltas and alluvial fans often shift their courses
15. *(116) How rivers may become drowned, beheaded or rejuvenated
16. *(117) What the conditions are that favor the making of alluvial terraces
17. *(72) Factors involved in the rate at which a stream may lower or build up the surface of the land
18. *(122) How streams may make the land smoother
19. *(145) Why streams in arid regions usually have steep banks
20. *(146) Why, as a rule, mountain valleys are narrow and deep, and plains valleys shallow
21. (87) How streams make and destroy falls, rapids and cataracts
22. (120) How a stream may make the land more rugged
23. (121) How excessive erosion may be retarded or stopped

MINOR PROBLEM III

How are the interests, activities and achievements of people affected by the streams and associated features with which they have contact? (The concepts of relationship involved in this sub-problem are largely of the type described in Case 1, Chapter II, page 17.)

1. (74) Why valleys are usually more fertile than adjacent hilly lands
2. (112) What makes alluvial plains, alluvial fans and deltas valuable
3. (75) How the texture of river deposits may affect the usefulness of the deposits
4. (113) Why living on deltas and alluvial plains is often precarious
5. (98) Why roadways often follow river valleys
6. (115) Why many river valleys are good for human habitation
7. (114) Where the most favorable places in valleys are for the location of towns and cities
8. (133) How the age of a valley may affect its usefulness to man
9. (94) How valley widening may modify man's use of the land
10. (134) How valleys are related to the history of a region
11. (95) How valley making may interfere with man's use of the land
12. (135) Why pioneer trails often made use of water gaps
13. (59) How the volume of a stream may affect its usefulness
14. (78) Why some streams are more valuable for power or irrigation than others
15. *(141) How the underflow of some rivers may be utilized
16. (90) What the conditions are that favor the building of dams in streams
17. (77) What some of the economic effects of the streams in my community are
18. (97) How the work of the streams in my community modifies the activities and interests of the people
19. (79) Why locks and canals are sometimes necessary in river valleys
20. (88) How waterfalls may help or hinder man's interests and activities
21. (89) How falls affect navigation
22. (105) How meanders affect drainage and transportation
23. (106) How to hasten the flow of meandering rivers
24. (107) How to make shallow and shifting rivers more navigable
25. (101) How to prevent disastrous floods in the alluvial plains of some rivers

26. (144) How the stage of maturity of a river affects the human activities associated with it
27. (119) How population distribution and movements in my community have been influenced by land forms
28. (111) How human interests and activities in some places I have seen have been affected by aggrading or by degrading streams
29. (126) How human interests and activities in some places I have seen are adapted to different stages of topographic development
30. (148) Why we may expect rivers to become more and more useful to man

References:

Tarr and Von Engeln, New Physical Geography
Salisbury, Physiography
Lackey, Studies in the Principles of Geography
Ridgley, Geographic Principles
Huntington and Cushing, Principles of Human Geography
Salisbury, Barrows and Tower, Elements of Geography
Huntington and Carlson, Environmental Basis of Social Geography
Peattie, New College Geography
Lobeck, Panorama of Physiographic Types

The Materials of the Major Problem Adapted to Elementary and Junior-High-School Levels

Pupils in the elementary school are able to understand and assimilate as a whole or in part many of the concepts involved in this unit of work. To be sure, the more complex items belong to junior-high school or perhaps to college levels. A general notion of materials suited to the capacities of elementary children for this type of work can be found in several elementary textbooks in geography.[8] Constant reference to the geography of the local area is necessary in the elementary and junior-high school and studies suited to the upper levels are available, also.[9]

Before the work on rivers and associated features is completed in the college course, the prospective teacher should try his ability at organizing a unit of work for elementary or junior-high-school level. The task could be made a group project in cooperation with a training-

[8] *Clark, Unit Studies in Geography,* pp. 9-10.
Dodge and Lackey, Elementary Geography, pp. 31-40.
Fairbanks, Home Geography for Primary Grades, pp. 73, 80, 91-97, and 98-102.
Frye, Home Geography, pp. 66-69.
Huntington, Benson and McMurry, Living Geography, Book I, pp. 65-70 and 303.
Ridgley and Dillon, Local Geography for Beginners, pp. 57-64.

[9] *Bowman, South America,* Chapter 13.
Brigham and McFarlane, Essentials of Geography, Book II, pp. 11-16.
Dodge and Lackey, Advanced Geography, pp. 1-2 and 43-45.

school teacher, who, as a climax to the work, might carry the joint product into the laboratory school as a demonstration unit. In doing this it would be well, by way of a type illustration, to follow the "mastery formula" procedure.

An Appraisal of the Students' Initial Knowledge of the Unit

The organization of the unit having taken definite form in the major problem and associated minor problems with the implied questions properly allocated, it becomes necessary to decide on the next step in the procedure. A rapid mental survey of the implied questions will soon convince students that there is much to be learned. A rough measure of what is already known will be desirable, especially since final achievement usually takes initial attainment into account. Is there any possible way to secure such a measure? No standardized tests covering these materials are available, and any sort of an improvised measure certainly would not be very accurate. But even a crude measure might be helpful, so the teacher's pre-test may be set up as an instrument. The following is a portion of a pre-test given to a group of teachers'-college students who were just beginning their study on this unit of work. In this procedure may be recognized the application of the Morrison technique.[10]

A Test Involving Streams and Associated Features

A. Select the word or group of words from the list below that best completes the following sentences. Into the parentheses at the left place the letter which indicates the omitted (x x x x) word that gives the best meaning to the sentences. Number zero shows that (n) *river basin* is correct.

(a) alluvial fan	(f) load	(k) mouth
(b) delta	(g) channel	(l) deposit
(c) side cutting	(h) drainage	(m) source
(d) runoff	(i) stream	(n) river basin
(e) system	(j) meander	

(n) 0. The whole area drained by a river and its tributaries is called x x x x.

( ) 1. The water that flows away over the surface of the land after a rain is called x x x x.

( ) 2. Each of the valleys in my community was made mostly by the x x x x in it.

( ) 3. A wide sweeping curve in a river is known as a x x x x.

( ) 4. The place where a river flows into another body of water is its x x x x.

( ) 5. The deposit of fine soil at the mouth of a stream is known as a x x x x.

[10] *Morrison, The Practice of Teaching in Secondary Schools*, pp. 232-243.

B. Put a plus (+) before each *true* statement, and zero (0) before each *false* statement. *Guess* if you do not know.

( ) 11. A delta is an illustration of the work of an aggrading stream.
( ) 12. Waterfalls are always a hindrance to navigation.
( ) 13. Alluvial fans are usually built at the base of a steep slope.
( ) 14. Rivers may make their valleys shallower.
( ) 15. Terraces are usually associated with the development of canyons.

C. Before each word or group of words in Column I place the letter designating the word or group of words in Column II with which it is most closely associated.

Column I	Column II
( ) 21. Delta	a. Hydro-electric power
( ) 22. Waterfalls	b. Relatively high land
( ) 23. Side cutting	c. Winding course
( ) 24. Divide	d. River mouth
( ) 25. Meander	e. Valley widening

E. Into the parentheses below write the letter designating the word that gives the correct meaning to the completed sentences. The numbered blanks on the left margin correspond to the numbered omissions in the sentences.

( ) 31. Falls and rapids, used for (31), are common
( ) 32. where (32) streams flow from (33) to (34) rocks
( ) 33. at Niagara.
( ) 34.
( ) 35. Old (35) are so broad and old (36) so low
( ) 36. that the surface is reduced almost to a (37), or to
( ) 37. a peneplain.
( ) 38.
( ) 39. In a (38) stream there are few (39) but
( ) 40. many (40).

(a) plain	(e) divides	(i) valleys
(b) water power	(f) strong	(j) weak
(c) young	(g) tributaries	(k) aggrading
(d) degrading	(h) waterfall	(l) mature

F. Into the parentheses below place the letters designating the correct way to complete the sentences.

( ) 41. The streams of my community are probably (a. older than) (b. younger than) (c. same age as) the valleys through which they flow.
( ) 42. The divides between the streams in my community are (a. younger than) (b. older than) (c. same age as) the valleys.

( ) 43. As a rule (a. young) (b. mature) (c. old) valleys are best for agricultural activities.

( ) 44. Canyons, gorges and waterfalls are generally characteristic of (a. young) (b. mature) (c. old) streams.

( ) 45. Bayous, natural levees, meanders and cut-offs are characteristic of (a. young) (b. mature) (c. old) streams.

G. Put a plus (+) before all true statements. If a statement is false, draw a line through the word or words that make it false. Write the correct word or group of words in the space before the statement.

_____ 51. Streams usually build alluvial fans in the quiet bodies of water into which they flow.

_____ 52. Valleys are usually more fertile than adjacent hilly land.

_____ 53. Small streams do not act as barriers to transportation.

_____ 54. Dikes and canals are often built to enable man to navigate streams which have waterfalls and rapids.

_____ 55. Streams tend to develop valleys with variable gradients.

Summary of the Pre-Test

There were sixty exercises in the test and fifteen students in the class. Table XXII summarizes the achievement not of each individual but of the group as a whole on the pre-test.

TABLE XXII

Number of Students Answering the Different Pre-Test Exercises Correctly

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
26	32	27	43	2	40	12	3	14	1	4	9	7	21	25	22
28	55	30	51	33	41	15	6	16	50	5	13	18			31
54		44		34		46	8	17		10	19	23			52
		47					36	38		20	24				
							39	48		35	29				
							42	56		49	37				
							45	57		58	59				
							53	60							

In summarizing, the possibilities for guessing were not taken into account.* On this basis the class achievement was 51 per cent.

* Since no penalty usually is attached to a low score in a pre-test, perhaps it would be easy to eliminate this disturbing factor almost altogether.

There are three exercises (Numbers 26, 28 and 54) on which all students failed. There were three exercises (Numbers 22, 31 and 52) that were answered correctly by all students. Only six of these exercises involved the cultural-to-natural relationship. Three of the latter were the ones answered correctly by all the students.

Each student was informed both as to his own achievement and that of the class. The teaching technique and psychological aspects of the pre-test were discussed with the students at this point, and a survey made of the possible next steps that might be taken. Among the possible next steps, the merits of the field study were given consideration, and won the approval of the student group.

Pre-tests covering the items concerning rivers and associated features that were appropriate to elementary and junior-high-school levels are not available. In fact, it has not been determined how these subject-matter materials should be allocated in the various grades of the public school. However, this study indicates that the achievement of children by the time they have completed their work in the junior-high school should include approximately the materials suggested by all implied questions rating 50 per cent or above.

Although advanced phases of the geography of the local area for the upper levels of the public school are very desirable, and are taught very largely in the schools of Europe, in our country much of this work is neglected entirely or taught only incidentally. Prospective teachers in the introductory course in college geography should recognize this and be prepared to assess the achievement of junior-high-school children in their understanding of the geography of the local area. For this reason, it is desirable that the prospective teacher be given practice in the construction of tests for this purpose. Only the materials suggested by implied questions rating 50 per cent or above should be considered in making such tests. It is assumed that the technique of test-making has been covered in professional integration courses and, therefore, needs no attention here.

The Observational Field Study

The field study is the heart of this unit of work. In it the principle of objectivity should be operating at its best. All but one of the ninety-five implied questions were rated 30 per cent or higher by the teachers'-college judges relative to the possibilities of illustrating involved concepts either in miniature or in reality out-of-doors in the home area (See page 41). Since college teachers of geography see such great possibilities for objective teaching in the home area, and since psychologists and other specialists in education assign so much importance to the environment in the education of the individual (See pages 6 to 9), the importance of this objective work should not be underestimated.

The field study was taken by motor-bus, covering about ten miles of distance, and three hours of time. There were many stops on the

way and several times the class disembarked for a study of features that were not visible from the motor-car.

Specific directions in mimeographed form describing the route and the features to be observed were put into the hands of each student. The instructor explained geographic features, and asked and answered questions.

The students were asked to check their observations by filling in a completion exercise which involved one hundred items. In doing this they were permitted and encouraged to consult their notes and to work in groups. The following is representative of the items called for in this exercise:

Completion Exercise Covering Field Study*

On the field trip this afternoon we started from the *1* (building). The campus of the University is about *2* feet above sea level and is built on a *3* (land form) made by *4* (stream). Looking east at 11th and R Streets the land slopes down to *5* (stream) and looking west it slopes down to *6* (stream). The Government Square is on the same land form as is the University, namely, a *7* (land form), but the Burlington Station is on the *8* (land form) plain of *9* (stream). 9th Street is on a *10* (land form), to the west of which is *11* (land form) and to the east of which gently rises the *12* (land form). The wholesale district, industrial plants and railroads are chiefly on the *13* (land form) of *14* (stream).

A separate numbered sheet was given to each student on which to write his answers. The review with the class of the completion exercise led to a discussion of the psychological implications of the field work and also to a survey of the possible next step in the study. The instructor, of course, saw to it that the laboratory exercise on the physiographic diagram of the local area received favorable consideration.

While the field work is of outstanding value for college students because of its objectivity, it is doubly important for elementary and junior-high-school children. The individual who has had no field work in geography prior to his entrance into college has labored under a distinct handicap in the public school through all of his courses in geography as well as in related lines of work.* For this reason, field lessons should be planned for public-school children, covering the more elementary concepts of this unit. Only eight of the implied questions were rated below 40 per cent by the college teachers relative to the possibilities of illustrating the suggested concepts in the home area, and in this respect more than half of the implied questions were rated above 40 per cent by elementary and junior-high-school teachers. It

* This exercise following a field presentation corresponds to one of the tests in the "mastery formula" procedure.

* See assumptions and principles in Chapters I and II.

is safe to assume that as a rule the teachers mentioned above have had but little training in *field* work. Their high rating of the implied questions, therefore, adds emphasis to the outstanding possibilities for this type of school training.

The prospective teachers under the guidance of their teacher of academic geography and the geography teacher in the laboratory school should plan a field trip for children in which appropriate items concerning rivers and associated features stand out prominently. A demonstration lesson in the field with children following the procedure outlined would convey a touch of reality that the prospective teacher would be bound to appreciate.

The Laboratory Exercise on the Home Area

Some of the major natural features of the local area and their relations to each other were obscured by cultural features, such as business houses, residences, manufacturing plants, etc. For this reason, a physiographic diagram of the local area was constructed in order to bring a number of important but partly hidden features and relationships more clearly to the mind of the student, and at the same time to give desirable repetition in connection with new situations and new problems. The following directions for the students relative to their work on the physiographic diagram were constructed and used.

Physiographic Diagram of a Part of Lincoln

A Laboratory Exercise

Purpose.

To bring about a reorganization and reconstruction of experience relative to the home area.

Materials Needed.

Outline physiographic diagram of the local area, political map of the home area, and colored pencils.

Studies.

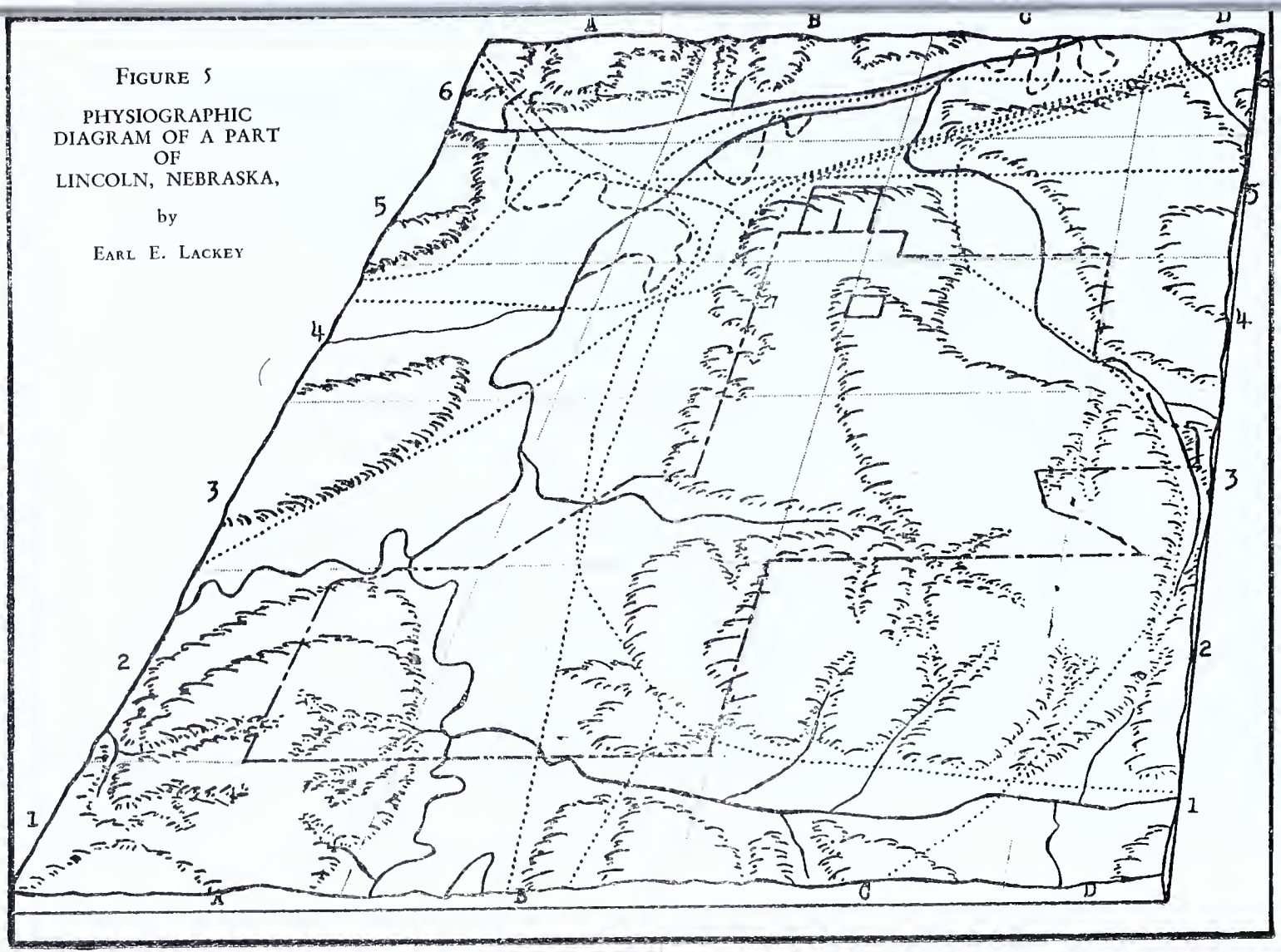
1. The area represented by this diagram is three and one-half miles wide (from east to west), and five and one-half miles long (from north to south). The rectangles along the south and east sides are each one-half mile wide.
   (a) How long are they?
   (b) What are the dimensions and area of each of the other rectangular sections (for example, area B2)?
2. The small rectangle in the east half of B5 represents the University campus, four blocks square.
   (a) What street runs along the east side of the campus? Label it.
   (b) What street is three blocks south of the University campus? Label it.

FIGURE 5

PHYSIOGRAPHIC DIAGRAM OF A PART OF LINCOLN, NEBRASKA,

by

EARL E. LACKEY



(c) The east-west street between 3 and 4 one mile south of O Street is A Street. Label it.

(d) The east-west street between 1 and 2 is Pioneer; between 2 and 3, Van Dorn; and between 5 and 6, Holdrege. Label each of these.

(e) The north-south street between A and B is 1st; and between C and D, 27th. Label these streets.

3. Salt Creek enters this area at the southwest corner of B1 and leaves the area on the north side of C6. Label this stream. Beal's Slough enters Salt Creek from the east in B2; Haine's Branch from the west in A3; Middle Branch from the west in A4; Oak Creek from the north in C6; and Antelope Creek from the south in C6. Label each of these streams. The depression in the northwest portion of A5 is Lincoln Salt Lake. Label it and color it blue.

4. The *Rock Island* Railroad follows Antelope Creek; the *C. B. and Q. to Nebraska City* follows Beal's Slough; the *Union Pacific to Beatrice and Manhattan* goes up Salt Creek; and the *C. B. and Q. to Kansas City* goes south through B1; the *C. B. and Q. to Denver* goes up Haine's Branch; the *C. B. and Q. to Billings* goes up Middle Creek; the *C. B. and Q. to Grand Island,* and the *Union Pacific to Central City* go up Oak Creek; the *C. and N. W. to Fremont* goes north from D6; and the *Missouri Pacific* goes to Omaha and Kansas City east through D5. Label these several railroads.

5. The alluvial plain of Salt Creek and its tributaries should be colored green; the terraces bordering the alluvial plain, light brown; and the uplands (drift hills), dark brown.

6. The observation field trip, starting at the University campus, follows the route indicated by the dot-dash (. — . — .) line. Accentuate this line in red.

7. Oak Creek channel formerly followed the course of the dashed line in A5, and Salt Creek formerly the course indicated by the dashed lines in B5 and C6.

(a) Why do you think the channel was straightened?

(b) Why was the channel not straightened in sections B1, B2 and A3?

8. How do the directions of the tributary streams and valleys give a clue as to the direction of flow of the master stream?

9. Using the terms M1, M2, etc., indicate some meanders in areas A3 and B1.

(a) Why do streams meander?

(b) As time passes, what is likely to happen to the large meander on the south edge of B1?

10. Indicate by L1, L2, etc., some places in C2 where the valleys may be increasing in length by headward extension.
    (a) How will such action at first affect the topography?
    (b) As time passes, what further modification in surface may be expected?
    (c) Where in the course of the stream flowing westward across section B3 is the gradient steepest?
11. (a) Why do some of the streams of this area carry more water than others do?
    (b) Why are some of the streams in A2 intermittent?
    (c) Why is soil being eroded and carried away from section C2 and deposited in B3?
12. (a) Why is the business district of Lincoln built chiefly on an alluvial terrace?
    (b) Why do the railroads follow valleys almost exclusively?
    (c) Why is the west edge of the residential district near the middle of sections B2, B3 and B4?
    (d) Why does the Lincoln residential district expand southeastward rather than westward?
    (e) Why was Lincoln High School built in Antelope Valley near the center of C4?
13. (a) Why does the Rock Island Railroad follow a spur between two small valleys in D1?
    (b) How do you account for the sandstone outcrops in the northwest corner of B1?

In reviewing with the students their work on the physiographic diagram of the local area, the teaching value of this type of exercise was taken up. In general, it was found that many features of the study deserved discussion; for example, the merits of perspective landscape sketching, the color scheme, the desirability of much or little detail in the diagram, the possibilities of each teacher learning to do sketching of this kind, and the faithfulness with which natural features may thus be portrayed.

One of the difficulties in the teaching of geography is that of translating the symbols of maps and the content of pictures into realities. On the other hand, it is important that the individual learn how to translate realities into map symbols and into the light and shade of pictures. For this reason, it is very desirable that photographs be taken of prominent features seen on the field trip, and that maps and sketches of the terrain be drawn and studied. Human interests and activities as related to streams and stream features should have a prominent place in the maps and pictures. If a physiographic diagram of the local area is available or can be drawn by someone for the group, it should be used. The prospective teacher studying this unit of work will profit greatly by working out on the general plan of the foregoing exercise a series of simple studies designed for pupils of the elementary or junior-high school. If the physiographic diagram is

not available, then sketch maps and photographs may be used to advantage.

The psychological next step, following the completion of the laboratory exercise on the physiographic diagram of the local area, was considered at this point. It was recalled that the rated implied questions in the major problem led to the out-of-doors for objective illustrations of geographic concepts. When the question was raised as to the next step in the procedure, it was proposed that a return to a study of the implied questions of the problem would now be in order. This suggestion prevailed and the teacher's presentation concerning the uses to be made of the implied questions followed.[11]

The Attack on the Major Problem Continued

First of all, the students must be made definitely, and, if possible, enthusiastically, aware of the problem, of its several parts, and of the larger implications involved. The pre-test, the observational field study, and the laboratory exercise on the physiographic diagram must contribute at every point possible in the continued study of the problem. According to the rating by the thirty teachers of geography in teachers' colleges a very large proportion of the concepts suggested by the implied questions can be illustrated in the home area. The field and laboratory studies were organized for this very purpose, that is, to make objective use of the home area.

Implied Questions as Related to the Developing of Geographic Concepts of Facts and Things

The materials involved in the first two minor problems deal almost, if not wholly, with *natural environmental* facts, things and relationships. Human and cultural elements are almost entirely absent.

The starred (*) implied questions in the original lists (See Appendix B) involve concepts of facts and things, and all the others involve relationships, either direct or implied. In the first minor problem about one half of the implied questions (Numbers 76, 68, 93, 54, 55, 118, 132, 136, 137, 143, 123 and 129) involve concepts of facts and things concerning natural environmental items. Many of these concepts were illustrtaed either in miniature or in reality in the field study. Many were again studied in a little different setting in the laboratory exercise. A general recapitulation and rounding out of these concepts of facts and things come again through the use of the implied questions in class discussion. Drill in the technical geographic terms involved in the unit is very essential, but not more important than the visual content such terms suggest. A knowledge of geographic concepts of facts and things relative to the natural

[11] *Morrison, The Practice of Teaching in the Secondary School,* pages 243-256.

environment is necessary and preliminary to all sound thinking in terms of geographic relationships.

Implied Questions as Related to the Developing of Geographic Concepts of Natural-to-Natural Relationships

The concepts of relationship suggested by the implied questions in the first two minor problems are all of the natural-to-natural type. The cultural or human elements are not involved. A large number of questions of this type were encountered also in the field and laboratory studies, that is, questions involving relationships.

It is essential that students understand what is implied in the term, *relationship*. First of all it must be made clear that more than one factor is involved. It must be seen that two or more factors are involved, and that the characteristics or behavior of one is dependent in some measure on the characteristics or behavior of one or more of the others—in other words, these factors are *related*. This may be illustrated by the use of implied question Number 56, which is practically the same as question Number 11a in the laboratory exercise, page 81.

This implied question carries in it the assumption that some streams of the local community carry a larger volume of water than other streams do. Now this assumption is one of the crucial factors. It is assumed to be the *known* factor in the problem. Of course, the first step is, to be sure that the assumption in the question is true. In this case no proof is necessary, as it is a matter of common observation that some streams carry a greater volume of water than others do. If the truth of the assumption were not apparent, some more or less accurate measure might need to be applied.

The *Why* in the implied question calls for a listing of factors associated with the assumed factor and a statement of how the associated factors help to account for the differences in the volume of the streams of the local community. In other words, a statement of concepts of relationship is sought.

The psychological sequence at this point is to fall back on the students' accumulated body of experience, supplemented by their first-hand experiences with streams and associated features in the observational field study. At any rate it is just here that the students are expected to furnish specific illustrations of streams carrying differing volumes of water and suggest reasons for the differences.

Here is a list of factors that a group of students taking the field study suggested when the study was made objective. The implied question was changed to a real question and made specific rather than general. The following is the outline of a class exercise used in teaching a method of developing concepts of relationships from implied questions:

A. Why does Oak Creek carry a larger volume of water than does Beal's Slough? (The students were told that it was desirable to list all possible factors, with the expectation later of eliminating irrelevant ones.)
   a. Oak Creek may have a larger channel than Beal's Slough
   b. Oak Creek may have a larger drainage area than Beal's Slough
   c. The valley sides of Oak Creek may be steeper than are the valley sides of Beal's Slough
   d. Maybe the soil is more porous in the drainage basin of Beal's Slough
   e. Perhaps there is more rainfall in the Oak Creek drainage basin
   f. Maybe the channel of Oak Creek extends farther down into the saturated zone of ground water
   g. Possibly the Beal's Slough drainage basin has gentle rains and Oak Creek drainage basin torrential rains
   h. Maybe the water in the Beal's Slough drainage area is used for irrigation
   i. The possibility that the Beal's Slough drainage area is more largely under cultivation might be an important consideration
   j. Evaporation may be greater in the Beal's Slough area

Enough factors have been stated to indicate the procedure. An investigation of these ten factors associated with the major assumption showed that only (b) and perhaps (f) were tenable. Therefore, with the investigation carried no farther than this, the students were able to say tentatively, that *Oak Creek carries more water than Beal's Slough because the former has the larger drainage basin and the channel extends farther into the saturated zone of ground water.*

The above is a *concept of a particular relationship,* such as is explained on page 14. If it were found that what holds true concerning these two streams is universally or nearly universally true, then the statement might be transformed tentatively into a *concept of a generalized relationship.* Thus, *the volume of water carried by streams varies directly with the size of the drainage basin and the depth to which the channel extends into the saturated zone of ground water.*

If it were desired that the concept be freed from technical nomenclature, perhaps a less accurate but more easily understood statement might read thus: *The larger the drainage area and the deeper the channel of a stream the more water it is likely to carry* (See note at bottom of page 51).

A *concept of relationship* in the same connection, but taking more factors into account is stated on page 51. In some communities, however, the concept, thus stated, would not take enough factors into account. For instance, factors (h) and (i), previously listed, must be considered in some areas. If the question were asked, "How is irrigation related to the amount of water carried by rivers?" the concept might be stated thus: *The amount of water carried by a river varies inversely with the amount withdrawn for irrigation.*

Thus it may be seen that the general question, "*Why do some streams carry more water than others?*" may be analyzed into a number of specific questions, each of which may involve two or at the most just a few factors, instead of many. For instance, each of the ten factors listed under the question concerning Oak Creek and Beal's Slough may be transformed into a question, each of which involves fewer factors than the general question does. And each of these questions may be answered by stating a concept of relationship (See page 51). A meticulous adherence to approved teaching technique would impel the teacher at this point to give a test or oral quiz relative to the students' understanding of the materials covered in his presentation.

The other concepts of relationship introduced by the implied questions in the first two minor problems may be developed in a manner similar to the class exercise just outlined. Tentative statements of relationship involved in some of the implied questions are given in Chapter V. These, however, are given as suggestions to the teacher, and perhaps should not be put directly into the hands of the students.

The class assignment at this point included the task of developing concepts of relationship suggested by the implied questions in the first two minor problems. Herein came one of the major assimilative phases in the study of the unit. Previous work on the unit was reviewed. Texts and reference books were read. Maps were studied. Group conferences were held. The instructor was consulted. Other available sources of information were uncovered. And this was all done in order to further the students' understanding of the relation of the first two minor problems to the major problem. Immediate and continuous contact with the problem was maintained through the use of the implied questions. In order that the prospective teacher should not forget the relation of this material to pupils in the public school, elementary and junior-high-school texts were consulted freely. The assimilative procedure in teaching is fully explained by Morrison.[12]

A clearing-up and organizing of the material accumulated in the assimilative period of study was accomplished through the medium of class discussion.[13] It must not be assumed, however, that complete and final answers to the questions have been worked out. Students must be kept aware of this fact. The factors involved are mostly variable. It is not certain that all pertinent factors have been taken into account. One cannot be sure that the various factors that are involved have been properly weighted when conclusions were drawn and concepts of relationship stated. Therefore, in organizing the materials collected during the assimilative period, due account must be taken of variability both in natural and in human items.

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[12] *Morrison, The Practice of Teaching in the Secondary School*, Chapter XVI.
[13] *Ibid*, Chapter XVII.

Implied Questions as Related to the Developing of Geographic Concepts of Cultural-to-Natural Relationships

The third minor problem consists entirely of implied questions involving human interests and activities as related to natural environment or, in other words, cultural-to-natural relationships. This phase of the study of the unit was introduced by a short pre-test in which cultural-to-natural concepts of relationships were featured. The pre-test was constructed as a multiple-choice exercise and set up in a form similar to the outline of the problem on Oak Creek and Beal's Slough (See pages 84 and 85). The following is a part of the pre-test exercise and illustrates how, in the teaching of a unit of work, important features of a teaching procedure may recur. Thus, it is seen that the "mastery formula" procedure has been adapted not only to the unit as a whole, but also to the sub-problems into which the unit is broken up.

A Test Concerning Streams and Associated Features as Related to Hmuan Interests and Activities

In each of the following exercises one of the five choices listed is either untrue or of less importance than the other four. Place in the parenthesis before the exercise the letter indicating this least attractive choice from the standpoint of human relationships:

( ) 1. The volume of a stream may be an important factor in connection with (a) transportation, (b) irrigation, (c) its velocity, (d) recreation and (e) power.

( ) 2. The value of a stream for power depends on (a) its gradient, (b) its volume, (c) its constancy of flow, (d) its location and (e) the purity of its water.

( ) 3. The value of a stream for irrigation depends on (a) its quality, (b) its quantity, (c) its constancy of flow, (d) its velocity and (e) its source.

( ) 7. Roadways often follow valleys because (a) a water supply is thus available, (b) wood for fuel is easily secured, (c) the slopes are less steep, (d) the farm land is more fertile and (e) less liability of destruction by floods.

( ) 9. Explorers and pioneers often followed rivers and river valleys because (a) water for drinking is available, (b) interstream areas are often hard to cross, (c) the streams afford protection from enemies, (d) fuel is usually more available and (e) the relatively lower gradient makes travel easier.

The achievement of the students on the pre-test was comparatively high, approximately 60 per cent. This was probably due in part to an inherent weakness in the test rather than to superior ability of the

students. It was difficult to make all five choices equally attractive. Often the untrue or weak factor in the choices stood out conspicuously. But, after all, the pre-test was a teaching, as well as a testing device, and so it served its purpose effectively in motivating the work and in emphasizing a method of deriving concepts of cultural-to-natural relationships. In reviewing the results of the pre-test, the teaching value of this type of exercise was discussed and appraised.

Implied question No. 98 carries in it the assumption that roadways often follow valleys. Pre-test exercise No. 7 involves the same assumption. The field study in this unit of work, together with the laboratory exercise, gave abundant first-hand evidence in support of this assumption. If the implied question were changed into a real question and made specific rather than general, it might be stated somewhat as follows: *Why do the railroads that come into Lincoln almost without exception follow valleys?*

In this question, the railroads represent cultural features and the valleys natural features. If there are one or several reasons for the phenomena assumed in the question, then concepts of cultural-to-natural relationship may be found and stated. The technique of developing statements of this type of concepts of relationship is similar to that used in deriving concepts of relationship where natural-to-natural items are involved (See page 84). A statement, covering the concepts the question calls for, might be stated thus: *The streams flowing into Salt Creek in the vicinity of Lincoln have developed valleys with low, even gradients. Railroads need low, even gradients, and, therefore, they follow the valleys.*

The development of the concept relative to the specific situation ought to help in enlarging the concept or in the developing of a series of concepts to cover the general situation called for in implied questions Nos. 98 and 135, and pre-test exercise No. 7.

The reader should recognize in the foregoing discussion that the teacher was again making use of the *presentation phase* of our chosen teaching procedure—the procedure used on pages 83 to 85.

A class discussion concerning the methods of developing statements of concepts of cultural-to-natural relationships was followed by an assignment involving the task of working out statements of concepts of relationships suggested by each of the implied questions under the third minor problem. This work called for correlated readings from a number of sources.

The Teacher's Margin of Knowledge

According to the rating by the thirty teachers'-college teachers of geography, all implied questions with a score between 50 per cent and 10 per cent involved material closely related to but probably beyond that which the prospective teacher (teachers'-college student) would be called upon to teach in the elementary or junior-high school. In many cases they throw more light on the phenomena there studied,

and in other cases, perhaps, they add marginal but related concepts to the unit of study. The implied questions covering the teacher's margin of knowledge are included in the major problem.

Some Crucial Present-Day Problems Associated with the Unit

The outstanding problems of the present in connection with the unit deserve thoughtful consideration. It is just at this point perhaps that the most justifiable criticism of the public school is registered. The schools are not teaching children how to find the crucial problems of today, nor are they teaching them successful methods of attacking such problems. Problems concerning the local area usually cannot be found in books. A keen alertness to the needs of the home area often yields fruitful questions of this type. The reading of local papers and inquiries directed to local officials and public-spirited citizens should yield results in the form of crucial problems. In general, problems of this type may be of purely local interest, or, on the other hand, of national or even international interest. The problems in the following list are limited to include those interests that are connected with rivers and associated features:

*1. Would it be desirable to require the Rock Island Railroad to vacate its present site through Antelope Valley and the residential section of the city and follow the alluvial plains of Salt Creek instead?

*2. What can be done to abate the smoke nuisance issuing from the industrial and manufacturing district?

*3. Can the more extended straightening of the channels of Salt Creek and its tributaries improve the use that might be made of the valleys?

*4. To what extent might it be desirable to promote the building of residential, business and industrial enterprises to the west and north of Salt Creek alluvial plain?

*5. Is it desirable to encourage more truck farming, floriculture and fruit-growing on the Salt Creek alluvial plain?

6. What can be done to prevent the disastrous floods in the lower Mississippi Valley?

7. Is further development of irrigation projects in the United States desirable at this time?

8. Should the proposed Great Lakes-St. Lawrence Deep Waterway be made a reality?

9. Should all the navigable rivers of the world be internationalized?

10. Should the people of the Middle-West favor or oppose a large program of inland waterway development?

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* The starred (*) problems are largely of local interest only, but the others are varied in their interest and appeal.

11. Would a program of more complete development of the available water power of New England improve conditions in the textile industry?
12. How can the bad effects of excessive erosion in the deforested areas of the Allegheny Plateau be ameliorated or overcome?

A Method of Attacking Crucial Problems[14]

In attacking problems of the kind just stated, it should be remembered that not all of the factors involved are of a geographic nature. But any thorough-going study of such problems must include a consideration of the geographic factors. Some of the points that could well be taken up in connection with crucial problem No. 1 might include:

a. Why the Rock Island Railroad was built in Antelope Valley
b. The dangers of the crossing on O Street
c. The noise and other disagreeable features in the residential district caused by the railroad
d. The advantages of the viaduct on west O Street contrasted with the dangers of the Rock Island crossing on east O Street
e. Cost of changing the route
f. Possible routes if the change were made
g. Possible uses that might be made of Antelope Valley if the Rock Island were to vacate it
h. How the city would be benefited commercially by the change
i. How the change would add to the beauty of the city and the safety and convenience of the citizens
j. Procedure necessary in bringing such a change about

It may be seen that the procedure in attacking a problem of this type is similar to that employed in attacking problem No. 58 as explained on pages 83 to 85. Of course, not all of the factors are geographic, but several of them have implications of geographic relationships that must be taken into account.

The more complex features of this problem command the intelligence and maturity of thought possessed only by adults, but the crucial nature of the problem and an understanding of the more elementary aspects of it are well within the comprehension of junior-high-school pupils. The fact that the Rock Island is near several of the schools of the city adds personal interest. This, then, is a case in which the interests and welfare of the child, of the school, and of society get together in part at least through the geographic subject matter of a crucial present-day problem.

The present investigator believes that one of the imperative needs of society, of the school, and of children today is, that the living,

[14] *Kilpatrick, Education and the Social Crisis,* pages 84-85.

vibrant problem of the now be introduced early into the experience of children*, not that they will solve such problems now, but that abiding, sincere and vigorous interests may be generated. The principles and assumptions set up in Chapter I seem to indicate that the individual in a dynamic society should very early in life be made aware of and sensitive to the crucial problems of the world in which he must live and make his contribution.

Some Major Understandings Involved in the Unit[15]

The major geographic understandings resulting from a study of the unit include largely those items connected with rivers and associated features. It must be remembered that this is only one of four of the units included under the large division, *Land Features of the Earth as Related to Human Activities* (See Appendix C) and that this large division represents only one of the five or more large divisions of natural environment. Moreover, the major understandings represent the large outcomes resulting from the work on the unit as measured by the criteria and objectives set up for geographic study in general, and for this unit in particular. More specifically, perhaps, the major geographic understandings derived from a study of this unit of work can be stated best by summarizing as fully as possible the inquiries raised by the major problem. Of course, such statements cannot cover in detail all the items in the problem, but ordinarily may be interpreted so as to cover each item. The major geographic understandings, therefore, are stated as abbreviated answers to the major problem and associated minor problems, and follow the sequence of the latter.

The major professional understandings involve, in general, a thorough comprehension and appreciation of the larger implications of the professional factors set up for the unit in the early pages of this chapter. As the work on the unit progressed, the bearing of these factors on the teaching of the materials was introduced and explained. A statement of the major professional understandings, therefore, consists largely in a recapitulation of how the professional factors were involved in teaching the unit of work.

The major understandings as conceived by this study were provisionally arrived at through the integration of a series of individual student reports on the outstanding phases of the various problems involved in the unit. The final statements were worked out through group effort and put into final form following a class discussion.

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* See assumptions and citations in Chapter I.

[15] *Morrison, The Practice of Teaching in Secondary Schools*, pages 306-316.

Major Geographic Understandings

I. *Understandings relative to the origin and nature of streams and associated features.*

Streams, as thought of in this unit of work, include all natural channels on the land through which water flows, even from the smallest gully or streamlet to the largest of rivers. It is understood, in general, that the valleys and channels through which streams flow were made by the streams themselves.

Streams consist, moreover, not only of the water that courses down their channels, but also of all the materials that are being moved from place to place by the running water. Different streams for sundry reasons vary much in the amount of water they carry, some flowing constantly while others are intermittent, some carrying destructive flood waters during certain seasons of the year while others fluctuate very little.

A study of streams and stream-made features in the local area yields abundant evidence that the land is being slowly but continually modified by the action of running water. A considerable vocabulary of geographic terms is essential in effectively describing the features of rivers and associated land forms. This vocabulary should be learned as nearly as possible through objective experience, either by direct recall or through the medium of well-planned field studies.

II. *Understandings concerning the activities of streams in modifying the areas through which they flow.*

Streams are continually gathering materials from some places and carrying them to and depositing them in other places. Destructional activity is going on in areas where materials are being removed, and constructional activities where the materials are being dropped.

The capacity of a stream to gather, carry and deposit its load of materials depends on a number of factors, chief among which are its velocity and its volume.

The age of a stream, of the valley through which it flows, and of the area that it drains, in each case is marked by certain well-defined characteristics, by means of which each may be classified—as young, mature or old.

In connection with the work of streams, there is, also, a special geographic vocabulary, much of which may be learned objectively by means of illustrative material available in the local area.

III. *Understandings involving the relationships between rivers and associated features on the one hand and human interests, activities and achievements on the other.*

Down through the many centuries of human history man has always recognized the many ways in which rivers and river valleys could contribute to his interests and welfare. Even today a very large proportion of the population of the world lives in river valleys.

The unifying of human interests, activities and achievements about rivers and river valleys is due in large measure to certain advantages offered for (1) travel and transportation, (2) water power, (3) water for irrigation, (4) water for domestic purposes, (5) water for animals, (6) alluvial soils for crop production, (7) food materials, (8) recreation, (9) the location of towns and cities, and (10) the disposal of waste materials in connection with human occupancy.

On the other hand, streams and their valleys offer ever-present barriers that take much of man's time, effort and treasure in bridging. This is true not only of large streams but of small streams as well.

The activities of streams in modifying the surface of the land must be taken into account continually by man, because his interests are so intricately interwoven with what streams do.

The extensive and ever-increasing role that streams and their associated features have and do play in the lives of hundreds of millions of people emphasizes the need for teaching students and children how to find and attack the crucial problems in connection with rivers—problems that are incessantly forcing themselves upon the attention of organized society.

Major Professional Understandings

IV. *Understandings involving the professional factors in teaching, as related to the unit of work.*

The professional understandings connected with the teaching of *Rivers and Associated Features* grow out of the specific application of the professional factors outlined early in this chapter. They include (1) a knowledge of the basic academic materials of the unit together with a comfortable margin of material closely related to but beyond that which one is expected to teach in the elementary and junior-high school; (2) a knowledge of the laws of learning and techniques of teaching that are associated with the subject matter of the unit, particularly those factors that emphasize the principle of objectivity in teaching basic concepts; (3) an appreciation of the historical background and influence that rivers of the world have played in the evolution of civilization; (4) a knowledge and appreciation of social objectives that underlie the selection and teaching of the materials of the unit; (5) a knowledge of the academic objectives that bring the social and educational objectives into fruition; and (6) a knowledge and appreciation of various methods of attacking geographic materials, especially as applied to the teaching of the unit on *Rivers and Associated Features.*

Evaluating Student Achievement

Some will think and it may be true that the weakest link in the teaching of the unit was in evaluating the achievement of the students. No final examination was given. However, the pre-tests were re-

peated at the close of the study in a slightly modified form and the improvements were noted. The results of the check-up tests on presentations were taken into account. The performance of each student in his organization of materials gathered during the assimilative period were considered in measuring his progress. The estimated achievement of the students was based on the foregoing flexible and somewhat indefinite measures.

The present investigator thinks that a carefully constructed final examination might be desirable. Such an examination should test for an understanding of professional factors as well as of academic subject matter. In so far as it would require review, the final examination no doubt would be valuable. In a small class, however, it ordinarily would contribute but little more toward evaluating the achievement of the students.

Summary Statement

It is certain that the investigator has taken large liberties with the "mastery formula"—liberties that the author might not approve. But the peculiar form in which the subject matter was projected into the unit, and the professional factors that had to be taken into consideration rendered difficult and perhaps undesirable the following of any stereotyped teaching technique. This accounts in part at least for the apparent mixed procedures that seemed to dominate the exposition of this unit of work.

The present investigator thinks that the procedure in the selection of subject matter for this unit of work in geography is unique. Moreover, he believes that the professional treatment of the material is probably unique also. The reader will no doubt find many places in the set-up wherein other and perhaps better procedures could have been used. The investigator himself recognizes a number of places where alternative procedures presented themselves, and he is not sure he has chosen the better in each case. However, it is believed that new ground has been broken and if the field is cultivated diligently under wise management it may yield more bountifully in the future than it has in the present instance.

CHAPTER VII

CONCLUSIONS AND IMPLICATIONS

Statement of the Problem

This study was undertaken to investigate a method of finding out (1) what some of the most important materials are for the course in introductory geography for the teachers'-college student, (2) to what extent these materials may be illustrated either in miniature or in reality out-of-doors in the home area, and (3) to outline for teaching a unit of professional subject matter selected by the foregoing method.

The Implications for Education of the Materials of the Study

An important phase of the study involved the task of showing how the point of view of modern geography correlates with the point of view of modern education. In Chapter II the basic assumptions of geography as seen by some of the best thinkers in the subject are shown to be very intimately related to the basic assumptions of specialists in the fields of psychology, sociology and education. Seven guiding principles and assumptions, therefore, were set up in Chapter I, which in abbreviated form may be stated as follows:

1. The human animal as contrasted with other animals is born with a marvelous capacity to learn.
2. The human organism learns what it practices.
3. The human organism learns through the "continuous reconstruction of experience".
4. The human organism is served primarily by those concepts which are learned through objective experience.
5. We are living in a period of rapidly shifting social values.
6. The public school should acquaint children with the crucial problems of present-day living.
7. Geography is neither a social science nor a natural science, but a socio-natural science—stressing the relationships between the human phenomena of the former and the natural phenomena of the latter.

Out of these principles and assumptions grow the criteria set up for the selection of the implied questions in the study.

An Integration of Essential Materials, Marginal Materials and Professional Elements

One of the underlying assumptions of the study is that geography in teachers' colleges should be presented from the professional subject-matter point of view. This means that two types of content matter are to be learned, namely, (1) those concepts which the prospective teacher will probably be called upon to teach in the elementary or junior-high school, and (2) those concepts which represent a comfortable margin of closely related content beyond that which is usually taught at these levels. The essentials of methods of teaching the subject are integrated with the teaching of the subject matter. This point of view is quite in contrast to the prevailing practice of having pure content courses preceded by or followed by courses in methods of teaching.

Validation of the Implied Questions

The implied questions and involved concepts included in the study, in general, satisfy one or more of the following seven criteria:

1. The criterion of human interests and activities
2. The criterion of natural environmental conditions
3. The criterion of relationships or interactions
4. The criterion of local applicability
5. The criterion of outside applicability
6. The criterion of crucial present-day problems
7. The criterion of possible utilization for professional subject matter in a course for teachers'-college students.

The Need for Objective Illustrations in Introductory Geography

The judgment of thirty teachers of geography in teachers' colleges indicated that out of the three hundred sixty implied questions only sixty-three ranked lower than 20 per cent relative to the possibilities of illustrating the associated concepts in the home area. This lends validity to the assumptions in Chapter I that teachers should capitalize at every turn on the possibilities the home area offers for objective teaching. The twenty-three elementary and junior-high-school teachers ranked all but ninety-eight of the three hundred sixty implied questions above 20 per cent. In general, this means that one-fifth or more of the teachers in each of the two groups of judges saw possibilities of illustrating in the home area about three-fourths of the concepts suggested by the implied questions.

The Judges and Their Work

Teachers of geography in teachers' colleges are vitally interested in introductory geography for prospective teachers. Thirty trained

teachers of geography in thirty teachers' colleges in twenty-five states rated the implied questions as to relative importance and as to the possibilities of illustrating the suggested concepts in the home area.

Teachers of geography in the elementary and junior-high schools are vitally interested in the geographic concepts children can and should learn. Twenty-three trained teachers of geography in elementary and junior-high schools in fifteen states also rated the implied questions.

From a statistical point of view the self-correlation of the ratings within each group was computed, and also the correlation of the ratings between the two groups. The statistical evidence points to a large measure of agreement within the two groups and also between them.

The Contribution Made By This Study

This study contributes to the field of geography and to teacher training in the subject in several ways:

1. It uses the judgment of teachers of geography in teachers' colleges in selecting the materials that are *very important* in introductory geography for teachers'-college students. The judgment of the same group was used in selecting the *marginal materials* with which prospective teachers should become familiar. The self-correlation in this group of judges was $.778 \pm 0.014$.
2. It uses the judgment of the same group also in judging the possibilities of the home area for the objective teaching of the concepts judged to be important. The self-correlation in connection with this work was $.826 \pm 0.01$.
3. It also uses the judgment of teachers trained in geography who were teaching children in the elementary and junior-high schools, in evaluating the material for introductory geography in teachers' colleges. The self-correlation in this group as to the relative importance of the implied questions was $.72 \pm 0.017$. The self-correlation as to possibilities of illustrating concepts in the home area was $.84 \pm 0.01$.
4. The correlation between the teachers of geography in teachers' colleges and the trained elementary and junior-high-school teachers as to the relative importance of the implied questions was $.83 \pm 0.01$. The correlation between these two groups as to the possibilities of illustrating the concepts in the home area was $.85 \pm 0.01$.
5. It classifies each group of the implied questions into ten percentile steps.
6. It indicates which of these percentile steps are to be considered *very important* according to the rating of competent judges.
7. It indicates which percentile steps are to be considered *marginal but closely related material* according to the rating of the judges.

8. It indicates the relative importance that is to be attached to the use of the home area in illustrating the materials of introductory geography for teachers'-college students.
9. It makes a unique use of judging technique in the selecting of basic and marginal subject matter in introductory geography for teachers'-college students.
10. It indicates how to find the essential subject matter with a minimum of controversial difficulty.
11. It uses a group of the rated implied questions as the basic material in a typical unit for a professional subject-matter treatment.

Limitations of the Study

There are a number of ways in which this study may prove inadequate. Among these may be noted:

1. A larger number of judges in each of the two groups might add refinement to the ratings, although the self-correlation was relatively high.
2. It may be that the three hundred sixty implied questions do not involve all the concepts that ought to be included in a study of *Land Features as Related to Man's Interests and Activities.*
3. A consensus of opinion even of specialists, while it gives a working basis upon which we may proceed, does not mean that the problem of the selection of subject matter is settled.
4. The lists involved so many items that the task of rating was a tedious one, and reliability may be lowered some on this account. Provision for checking reliability from this point of view was not undertaken.
5. The difficulty of starting all of the judges out with the same purposes in mind must be recognized even though each was given the same set of instructions.
6. The weighting of judgments for the purposes of reducing to a percentage basis was an arbitrary matter designed for the exigencies of the occasion.
7. The ever-changing and conflicting theories of prominent students of educational and social problems made the setting up of basic assumptions, principles and criteria not only difficult but also precarious.

Suggestions for Further Study

If this method proves to be valuable in the field of selecting, evaluating and presenting curricular materials in subject-matter fields, a number of other studies along similar lines could be undertaken.

1. This study includes implied questions on only one of the several natural environmental factors, namely, *Land Features of the*

Earth as Related to Human Interests and Activities. Implied questions concerning the other several factors could be subjected to a corresponding evaluation.

2. Other teachers'-college courses in geography might well have their materials evaluated in much the same manner.
3. As geographic study progresses more and more, it becomes desirable to evaluate declarative statements of geographic concepts. This study may furnish some suggestions for such a procedure.
4. The professional subject-matter treatment in this study applied to the unit on *Rivers and Associated Features* may serve as a rough pattern in the organizing and teaching of other geographic materials.

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APPENDIX A

A METHOD OF SELECTING AND EVALUATING MATERIALS FOR A COURSE IN INTRODUCTORY GEOGRAPHY FOR TEACHERS'-COLLEGE STUDENTS (WITH EMPHASIS ON THE HOME REGION) FOR A PROFESSIONAL SUBJECT-MATTER TREATMENT

Introductory Statement

The large number of concepts represented in the following lists of implied questions is meant to include all and more than can be taught in an introductory course in geography in teachers' colleges. From the lists teachers may choose and teach those concepts that to them are most important and which they are best located and best fitted to present. It is not presumed that there is no overlapping. In fact, much overlapping is very evident, but this is assumed to be desirable, inasmuch as practice and review materials are thus provided. It is hoped that all of the important phases of such a course have been included in the lists.

It is certain, however, that some of the concepts represented by the implied questions are more important than others, especially since the time for the course is limited and the students must master those that will prepare them best for teaching. For this reason it is desired that each implied question be rated as to its relative importance for this course, namely, a professional subject-matter course in introductory geography for teachers'-college students.

In order to give the point of view and a common purpose to those who assist in the rating, it is necessary that some explanations and directions be presented.

The Use of the Word Concept

It is thought that each of the implied questions in the following lists involves one or more geographic concepts. The word *concept* in this study is given a liberal interpretation. It includes two types of meanings:

1. Concepts of things or facts, and
2. Concepts of relationships.

First, as to *concepts of things or facts,* the meaning may involve:

a. A *concept of a particular thing or fact.* For example, an individual hill (Branson's Hill or Bunker Hill), or the population of Italy in 1921 (38,711,000).

b. A *concept of a generalized thing or fact.* For example, a delta (including characteristics that all deltas have in common) or 20 inches of rainfall.
c. The starred (*) items involve concepts largely of this type; namely, concepts of things or facts.

Second, as to *concepts of relationships,* the meaning may involve:

a. A *concept of a particular relationship.* For example, the relation of the Union Pacific Railroad to the Platte Valley or the relation of the location and growth of New York City to the Mohawk-Hudson Gateway.
b. A *concept of a generalized relationship.* For example, the tendency for transportation routes to follow valleys, or the tendency for cities to develop near the lower end of great rivers and valleys.
c. Items that are not starred involve concepts that are largely of this type, namely, concepts of relationships.

Criteria Used in Validating the Implied Questions

The validity of the concepts which the implied questions involve is based on several criteria set up for the selection of geographic materials for a professional subject-matter course in introductory geography for teachers'-college students. These criteria, omitting explanations, may be stated as follows:

1. The criterion of human activities, interests and achievements.
2. The criterion of natural environmental conditions.
3. The criterion of relationships or interactions.
4. The criterion of local applicability and appeal.
5. The criterion of outside applicability and appeal.
6. The criterion of applicability to crucial present-day situations.
7. The criterion of possible utilization for professional subject matter in a course for teachers'-college students.

In order to be geographic, each concept of relationship suggested by the implied questions must stand the test imposed by the first three criteria, and at the same time may satisfy one or more of the others. There are three different combinations of conditions in which the first three criteria are involved:

Case 1: Concepts involved in implied question No. 122 (Why roadways often follow river valleys) plainly involves man's interests (Criterion No. 1), river valleys (Criterion No. 2), and a direct first-step relationship (Criterion No. 3). This implied question, therefore, qualifies as geographic as measured by the first three criteria and in addition satisfies the demands of some of the other criteria.

Case 2: Concepts involved in implied question No. 79 (How streams of my community secure their supply of water) in the first-step relationship do not involve man's interests and activities (Cri-

terion No. 1), and, therefore, seem at first to be purely physiographic. But immediately when the first-step relationship is satisfied, man's interests at a second or third step removed from the original concept appear in many ways—domestic water supply and health, irrigation and crops, water power and manufacturing, and navigation and trade. On this basis the implied question, therefore, is admitted as important, and qualifies for the list. Other of the criteria are operative also in this case. A very large number of implied questions in the lists are of this type.

CASE 3: The concepts involved in the implied question, Why Indiana can have better schools than can North Dakota, seem at first not to involve all of the first three criteria. In the first step the relationship appears wholly social—schools (Criterion No. 1), taxation (Criterion No. 1), and relationship (Criterion No. 3). But immediately when we get into the second or third step removed from the original concept, it at once becomes apparent that natural environment (Criterion No. 2) is operative in numerous ways—difference in population density and amount of wealth accounting for difference of money available, and these conditions in turn falling back into natural environmental factors for their explanation. On this basis the implied question has important geographic implications and is, therefore, admitted as important. Some of the other criteria also are operative in the case just discussed. Only a few of the concepts in the lists are of this type.

THE HOME REGION ASPECT

In conformity to criteria 4 and 7, and perhaps others, it is desirable that students learn to think of their own experiences in terms of geographic relations and interactions. For this reason, students should be given an opportunity to reconstruct their objective experience in terms of geographic patterns of thought. Personal experience in the home region, thoroughly interpreted, creates a body of rich geographic meanings which serve as working tools in the study of distant regions. Therefore, the implied questions are stated so as to give as much local color to the concepts as is possible.

You are asked to check (√) each implied question that calls for a concept that usually can be illustrated *either in miniature or reality* a concept that usually can be illustrated *either in miniature or reality out-of-doors in the local area.*

THE PROFESSIONAL SUBJECT-MATTER ASPECT

The successful teacher must know well (1) the concepts he expects to teach and also (2) he should be familiar with a comfortable margin of related material beyond which he expects to teach. The concepts involved in the implied questions in the lists include both what he expects to teach and the comfortable margin beyond, and represent the subject matter for the professional course.

Summary

There are, then, a number of things that each judge should keep in mind when rating the implied questions. These are summarized as follows:

1. Each numbered item in the lists is an implied question involving a knowledge of one or more geographic concepts.
2. The word *concept* is given a liberal interpretation.
3. Seven criteria are applied in validating the implied questions.
4. It is not presumed that the listed questions include all of the desired concepts, but that they are quite representative.
5. The overlapping of content is intentional, premeditated and perhaps unavoidable.
6. The implied questions rating highest in the lists presumably involve the most important concepts and are the ones to be recommended for a course in introductory geography for teachers'-college students.
7. The rated lists should present a consensus of opinion of competent and interested judges as to what the most essential elements are around which to organize a professional course in introductory geography for teachers'-college students.
8. Any comment on the items in the lists may be written on the back of the respective sheets. Every item should be rated.

The Relative Importance of the Implied Questions

Assuming that the lists of implied questions involve practically all and probably more concepts than a teachers'-college student should learn, it becomes necessary to determine, as nearly as may be, the relative importance of the materials in the respective lists. In order to do this it is proposed that a large number of competent teachers of geography, acting as a jury, rate the implied questions as to their relative importance.

Directions for Rating

1. The spaces following the numbers on the *right margin* of each page are reserved for rating the implied questions as to importance.
   A means the implied question is *very important*—so important indeed that the student must be familiar with it before he completes his introductory course in college geography. The concepts involved are *very important* because he may be called upon to teach them in the elementary or junior-high school.
   B means the implied question is *important*—important because it is representative of that comfortable margin of knowledge, closely akin to but probably beyond that which he will be called upon to teach in the elementary or junior-high school.

C means the implied question is of *little importance*—of little importance because it is only distantly if at all related to teaching in the elementary or junior-high schools, or perhaps is too technical or irrelevant to be considered a part of a course in introductory geography for teachers'-college students.

D means that the implied question is not considered geographic as measured by the validating criteria.

2. The space on the *left margin* preceding the numbers is to be checked (√) if the implied question involves a concept that usually can be illustrated *either in miniature or in reality out-of-doors in the local area.*

For example, streams, work of streams and stream-built features (valleys, banks, falls, deltas, terraces, flood plains, tributaries, distributaries, meanders, cut-offs, etc.) usually can be illustrated out-of-doors on a small eroded slope.

Land forms, likewise, may be illustrated on an eroded slope (hills, mountains, slopes, valleys, divides, plateaus, canyons, etc.).

Land utilizations of many kinds are easily illustrated almost everywhere (building sites, highways, railroads, various agricultural uses, industrial sites, modifications in use, etc.).

In the case of any possibilities of illustrating the involved concepts in the home area, it should be checked. The major idea in this checking is to indicate the greatest possible use that can be made of the local area and of the first-hand experience of students and pupils.

APPENDIX B

IMPORTANT

SEE SUMMARY AND DIRECTIONS FOR RATING

A METHOD OF SELECTING AND EVALUATING MATERIALS FOR A COURSE IN INTRODUCTORY GEOGRAPHY FOR TEACHERS'-COLLEGE STUDENTS (WITH EMPHASIS ON THE HOME REGION) FOR A PROFESSIONAL SUBJECT-MATTER TREATMENT

1 I. HUMAN ACTIVITIES, INTERESTS AND EXPERIENCE AS RELATED TO THE NATURAL ENVIRONMENT

2 A. Introductory implied questions concerning the uses made of the land in my community 2A___

_ 3. *How the nearly level lands in my community are now used 3___

___4. *Where the level, the sloping and the rugged lands of my community are 4___

___5. *How the sloping or steep land in my community is used 5___

___6. *How the use of the land in which my home is now located has changed down through the years 6___

___7. Why sloping or steep land cannot as a rule be used in the same way as can the nearly level lands 7___

___8. Why so many rural schools are located at crossroads 8___

___9. Why my home is located at its present site 9___

___10. Reasons for some changes in the use of the land that are now being made in my community 10___

___11. Forecast of some possible future changes 11___

___12. Why residential districts have a tendency to spread over larger areas than they formerly did 12___

___13. What factors may be considered in selecting a home site in a town or city I have seen 13___

___14. Factors involved in selecting the home site on a farm I have seen 14___

___15. Why the family garden is usually near the home site 15___

___16. Why, as a rule, it is more desirable to have a home site on the higher land 16___

___17. How some low lands have been made more useful 17___

___18. How availability of water affects the use of the land in my community 18___

___19. Why animal shelters are so often built on south slopes 19___

___20. How the coming of machinery has changed the use made of the land in some places 20___

___21. Why the use made of some land changes from year to year 21___

___22. How the use made of some land changes with the seasons 22___

___23. How some particular surface feature of my community has been a definite handicap 23___

___24. Why a corner location for some business enterprises is usually more highly prized than other locations 24___

___25. Why buildings in the business districts in cities are usually higher than in the residential section 25___

___26. Why rents in a city are not the same on the different levels of high buildings 26___

___27. Why it is desirable in town and city to concentrate the business section within a limited area 27___

___28. Why manufacturing interests use cheaper land, usually, than do business interests 28___

___29. How the use of the land in some very definite place has changed, perhaps several times, since the region was first occupied by whites 29___

___30. Reasons for the present location of railroads, business section and residential district 30___

___31. Reasons for the present location of roads and streets 31___

___32. How topography in some places in my community has been the cause of irregular location of streets and roads 32___

___33. How topography affects the distribution of people in my community 33___

___34. What conditions have influenced the location of churches and school houses in my home area 34___

___35. How the accessibility of my home town to places outside is affected by land surface features 35___

___36. Why virgin lands are changed to farms and pastures; then perhaps to residential districts; then to business section; and finally maybe to manufacturing area 36___

___37. Why there are usually more rapid changes in the use of the land in cities than in rural areas 37___

___38. How the topography of some lands I have seen affects its value for various types of farming 38___

___39. Why the people in my community grow the crops they do 39___

___40. Why the kinds of crops grown near towns and cities I have seen often differ from crops grown farther away 40___

___41. Why manufacturing is carried on in some places in my community and farming in other places 41___

___42. Why corn-growing is better adapted to hilly slopes than is wheat-growing 42___

___43. Why some areas in my community are better adapted to the growing of crops by the use of machinery than other areas are 43___

___44. Why more intensive farming is carried on in certain parts of my community than in other parts 44___

___45. Why the value of land in my home region fluctuates 45___

___46. Why some areas in my community have not been changed from their primitive condition 46___

___47. Why farming has been abandoned in some areas I have seen and later reclaimed 47___

___48. Why forests in some places have been destroyed while in other places trees are being planted 48___

___49. Why man is so persistent in modifying the use he makes of the various surface features of the land 49___

___50. Why we are able to get more of the necessities of life from the land than the Indians were 50___

___51. How changes in the use made of the land depends largely on the interests and progressiveness of the people living on it 51___

52 II. LAND FEATURES OF THE EARTH AS RELATED TO MAN'S INTERESTS, ACTIVITIES AND EXPERIENCE

53 A. Implied questions concerning rivers and associated features 53A___

___54. *How streams of my community secure their supply of water 54___

___55. *How the surface run-off water in my community gets away 55___

___56. Why some streams in my home area carry more water than others do 56___

___57. What relation ground water bears to the volume of streams 57___

___58. Why some streams in my region are intermittent 58___

___59. How the volume of a stream may affect its usefulness 59___

___60. What is meant by the load of a stream 60___

___61. *How a stream gathers its load 61___

___62. *How a stream carries and disposes of its load 62___

___63. What the factors are that affect the amount of load a stream can carry 63___

___64. When a stream is over-loaded 64___
___65. What the factors are that affect the rate at which a stream may deposit its load 65___
___66. Why the water in a stream is not equally clear at all times 66___
___67. Why river deposits differ so much in degree of fineness 67___
___68. *What a river is (more than just water) 68___
___69. Why some streams are always muddy and others are clear 69___
___70. *What the tools of a stream are 70___
___71. How pot-holing is carried on in river beds 71___
___72. Factors involved in the rate at which streams may lower or build up the surface of the land 72___
___73. Why streams build alluvial plains, deltas and alluvial fans 73___
___74. Why valleys are usually more fertile than adjacent hilly land 74___
___75. How the texture of river deposits may affect their usefulness 75___
___76. *How the following stream features either in miniature or in reality are illustrated in my community: master stream or river, tributary or branch, river system, river basin, bank, right bank, left bank, meander, ponding, cut-off, oxbow, channel, course, gradient, steep gradient, uneven gradient, cut bank, shingle bank, natural levees, alluvial terraces, canyons, gorges, gullies, bayou, under-cutting, side-cutting, distributaries 76___
___77. What some of the economic effects of the streams in my community are 77___
___78. Why some streams are more valuauble for power or irrigation than others 78___
___79. Why canals and locks are sometimes necessary in river valleys 79___
___80. *How the streams of my community were made 80___
___81. *How a stream may lengthen its valley 81___
___82. *What the limits are to which a stream may lengthen its valley 82___
___83. *How streams make their valleys deeper or shallower 83___
___84. *What the limits are to which a stream may fill or deepen its valley 84___
___85. How glaciers may modify stream courses 85___
___86. How glaciation may make waterfalls 86___
___87. How streams make and destroy falls, rapids and cataracts 87___
___88. How waterfalls may help or hinder man's activities 88___

___89. How falls affect navigation 89___
___90. What the conditions are that favor the building of dams in streams 90___
___91. Why the current of a stream is fastest on the convex side of a bend 91___
___92. Why the bank is often steep on the convex side of a bend and more often low on the concave side 92___
___93. *How streams widen their valleys 93___
___94. How valley widening may modify man's use of the land 94___
___95. How valley making may interfere with man's use of the land 95___
___96. Evidence that the streams of my community even now are modifying the area through which they flow 96___
___97. How the work of the streams of my community modifies the activities and interests of the people 97___
___98. Why roadways often follow river valleys 98___
___99. What conditions favor the flooding of valleys 99___
___100. Why slow-moving streams are frequently subject to flooding 100___
___101. How to prevent disastrous floods in the alluvial plains of some rivers 101___
___102. Why slow-moving rivers usually have winding courses 102___
___103. Why streams meander 103___
___104. How sinuosity affects the length of a river 104___
___105. How meanders affect drainage and transportation 105___
___106. *How to hasten the flow of meandering rivers 106___
___107. How to make shallow and shifting rivers more navigable 107___
___108. *How flood plains differ from alluvial plains 108___
___109. Why distributaries are associated with deltas and alluvial fans 109___
___110. Why the distributaries over deltas and alluvial fans often shift their courses 110___
___111. How human interests and activities in some places I have seen have been affected by aggrading or by degrading streams 111___
___112. What makes alluvial plains, alluvial fans and deltas valuable 112___
___113. Why living on deltas and alluvial plains is often precarious 113___
___114. Where the most favorable places in valleys are for the location of towns and cities 114___
___115. Why many river valleys are good for human habitation 115___

___116. *How rivers may become drowned, beheaded or rejuvenated 116___
___117. What the conditions are that favor the making of alluvial terraces 117___
___118. *What is meant by topography 118___
___119. How population distribution and movements in my community have been influenced by land forms 119___
___120. How a stream may make the land more rugged 120___
___121. How excessive erosion may be retarded or stopped 121___
___122. How streams may make the land smoother 122___
___123. *How various land features may be illustrated on an eroded slope 123___
___124. *How to differentiate between young, mature and old topography 124___
___125. *How base-leveling or peneplanation is brought about 125___
___126. How human activities in some places I have seen are adapted to different stages of topographic development 126___
___127. How the work of reducing an area to base level may be hastened or hindered 127___
___128. *What is meant by a cycle of erosion 128___
___129. *How to illustrate land features on a sand table 129___
___130. *What is meant by antecedent and consequent streams 130___
___131. *How trellised drainage differs from dendritic drainage 131___
___132. *How young, mature and old valleys differ from one another 132___
___133. How the age of a valley affects its usefulness to man 133___
___134. How valleys are related to the history of a region 134___
___135. Why pioneer trails often made use of water gaps 135___
___136. *What a valley is 136___
___137. *How the following valley features either in miniature or in reality are illustrated in my community: main valley, tributary valley, valley system, valley sides, young valley, mature valley, old valley, gorge, canyon, gully, valley floor, cliffs, narrows, water-gaps, alluvial plain, flood plain, underflow 137___
___138. How the age of a stream compares with the age of its valley 138___
___139. How the age of a stream is to be interpreted 139___
___140. What the factors are that affect the velocity of a stream 140___
___141. How the underflow of some rivers may be utilized 141___
___142. Comparative gradient in the different parts of the course of a normal stream 142___

___143. *What is meant by youth, maturity and old age in connection with rivers 143___
___144. How the stage of maturity of a river affects human activities associated with it 144___
___145. Why streams in arid regions usually have steep banks, precipitous valley walls and as a rule few tributaries 145___
___146. Why, as a rule, mountain valleys are narrow and deep, and plains valleys shallow 146___
___147. How streams furnish an index to the history of the land 147___
___148. Why we may expect rivers to become more and more useful to man 148___

149 B. Implied questions concerning plains and their uses 149B___

___150. *How far I can see in different directions in my home community 150___
___151. *How extensive the greatest plain is that I have ever seen 151___
___152. Why one can see so far on a plain 152___
___153. Why road building as a rule is easy on plains 153___
___154. How the pattern of public highways in the nearly level or plains lands of my community differs from the pattern on the more rugged lands 154___
___155. How man's use of a plain I have seen has changed down through the years 155___
___156. How the nearly level lands in my community might become more rugged 156___
___157. How the ruggedest land in my community might become nearly level 157___
___158. Why plains as a rule have deeper and more fertile soils than do mountains and plateaus 158___
___159. Why extensive farming on semi-arid plains awaited the coming of big machines 159___
___160. *How plains streams differ from mountain streams 160___
___161. Whether we are to expect farms on the great plains of middle latitudes to become larger or smaller 161___
___162. *How some features of plains may be illustrated in my community or on the sand table 162___
___163. *What the different kinds of plains are 163___
___164. *How plains are made 164___
___165. *What is meant by constructional and destructional plains 165___
___166. *Where some of the great plains of the world are 166___
___167. Why some of these great plains hold greater promise for the future than others do 167___
___168. *What a peneplain is 168___

___169. How coastal plains are made 169___
___170. Why coastal plains often have sandy soils 170___
___171. *How piedmont plains differ from coastal plains 171___
___172. Why drift soil is usually productive 172___
___173. How so many rocks in drift soil are to be accounted for 173___
___174. Why ice-scoured plains are usually poor for farming 174___
___175. Why lake plains differ so much in fertility 175___
___176. Why sand dune plains are as a rule sparsely settled 176___
___177. *How to differentiate between young, mature and old plains 177___
___178. Why so many people live on plains 178___
___179. Why all plains are not equally good for human occupancy 179___
___180. Why plains differ so much in the types of vegetation that cover them 180___
___181. How natural vegetation adapts itself to plains with varying amounts of rainfall 181___
___182. Why civilized man is usually not satisfied with the natural vegetation he finds on well-watered plains in middle latitudes 182___
___183. Why interior plains in middle latitudes have great extremes of temperature 183___
___184. How plains usually make for uniformity in human interests and activities 184___
___185. Why crops adapted to a given plains region later may need to give way to some other crop or use 185___
___186. Why plains as a rule are better for farming than hilly or rugged lands 186___
___187. Why plains areas are best for extensive agriculture 187___
___188. What some of the types of crops are that are best adapted to extensive plains regions 188___
___189. What the types of architecture are that seem to fit plains topography best 189___
___190. Why manufacturing is often slow to start on plains 190___
___191. What types of manufacture are best suited to agricultural areas 191___
___192. How human activities and interests are adjusted to various types of plains; for example, cold treeless plains, hot wet plains and arid plains 192___
___193. Why plains in middle latitudes are more useful than those in low or high latitudes 193___
___194. Why plains in the same latitude are not equally useful 194___
___195. Why pioneer life on semi-arid plains may be precarious 195___

___196. What adaptations are making semi-arid plains more useful 196___

___197. How housing conditions on semi-arid and arid plains in general differ from those on humid plains 197___

___198. Why most of the great cities of the world are on plains 198___

___199. Why more great cities are on the margin of extensive plains than in their interiors 199___

___200. What some of the recreational diversions are best suited to plains conditions 200___

___201. Why the wet tropical plains are high in potential value 201___

___202. Why cold plains may have high future value 202___

___203. Why well-watered plains in middle latitudes are usually good for agricultural activities 203___

___204. Why humid plains in middle latitudes usually are conducive to higher standards of living than are arid or semi-arid plains 204___

205 C. Implied questions concerning hilly and rugged lands and their uses 205C___

___206. *Where the steepest slopes and highest hills in my community are 206___

___207. How much higher Pike's Peak (14,109 ft.) is than the tallest building in my community 207___

___208. How many times as tired it would make one to climb to the top of Pike's Peak as it would to climb to the top of the highest building. How many times as long it would take 208___

___209. *How the following highland features are illustrated in my community in miniature if not in reality (See eroded field or slope): mountain peak, mountain range, mountain system, summit, slope, volcanic mountain, block mountain, folded mountain, complex mountains, gorge, cirque, crag, mountain chain, ravine, timber-line or tree-line, snow-line, talus slope, passes 209___

___210. *What a mountain is as distinguished from hills or high plateaus 210___

___211. *How mountains are made 211___

___212. *What the names of some of the outstanding mountain peaks of the world are 212___

___213. Why as a rule there is more erosion on mountains than on plains 213___

___214. Why waterfalls are common in mountains 214___

___215. Why more rocks are exposed on mountains than on plains 215___

___216. Why there are more rocks and boulders in mountain streams than in plains streams 216___
___217. Why soil is usually shallow on mountains 217___
___218. Why mountains often abound in minerals 218___
___219. Why minerals usually are more accessible in mountains than on plains 219___
___220. Why divides migrate 220___
___221. *How to differentiate between young, mature and old mountains 221___
___222. How mountains act as barriers to the movements of plants, animals and man 222___
___223. Why mountains often have a great variety of vegetation 223___
___224. *What is meant by "alp" 224___
___225. How mountains capture moisture from winds 225___
___226. How climate changes with altitude on mountain slopes 226___
___227. Why snow is common in high mountains, even in summer 227___
___228. Why one side of a mountain is likely to have a lower snow-line than the other 228___
___229. Why one side of a mountain is likely to have more snow than the other is 229___
___230. Why the snow-line and tree-line are so much higher on some mountains than on others 230___
___231. Why high mountains may have many glaciers 231___
___232. How glaciers make mountains more rugged 232___
___233. Why climbing on mountain glaciers is dangerous 233___
___234. How hanging valleys are to be accounted for 234___
___235. *How to illustrate mountain folding 235___
___236. *How to illustrate block and complex mountains 236___
___237. *How much plateaus and mountains may vary in elevation 237___
___238. Why plateaus are so often associated with mountains 238___
___239. *What some of the important mountain passes of the world are 239___
___240. Why certain mountain gateways have varied in importance down through the centuries 240___
___241. Why mountains usually are better for stock-raising than for farming 241___
___242. Why mountains may need to be cultivated more in the future than they are now 242___
___243. Why goat-keeping is well adapted to some mountainous areas 243___
___244. Why dairying is profitable in some mountainous regions 244___

___245. Why terracing the soil is practiced on some mountain slopes 245___
___246. Why terrace farming is not practiced in all mountain regions 246___
___247. Why mountains are often reserved for nut crops 247___
___248. Why there are seasonal migrations between mountains and plains in some regions of the world 248___
___249. Why the slopes of many mountains have been reserved for timber 249___
___250. Why many people are much concerned about our timber resources 250___
___251. How forests on mountains may affect the interests of people in adjacent lowlands 251___
___252. Why mountains should not be denuded of forests 252___
___253. Why forest conservation is desirable 253___
___254. Why human activities change with elevation on mountain slopes 254___
___255. Why there is considerable of nomadism in some mountainous regions 255___
___256. How human activities in mountains may change with the seasons 256___
___257. Why mountaineers are often engaged in the making of small articles with high monetary value 257___
___258. Why household industries persist in some mountainous regions 258___
___259. Why mountain streams have so much of potential power 259___
___260. Why waterpower is cheap in mountainous regions 260___
___261. Why such a small proportion of the power in mountain streams is utilized 261___
___262. Why human activities in mountains vary so much in different countries 262___
___263. Why diversification of human interests is not so prevalent in mountain regions as on plains 263___
___264. Why mining communities in mountains are so often subject to variable prosperity 264___
___265. Why work is usually not so plentiful in mountains as on plains 265___
___266. Why it is more desirable that a mountaineer should be skilled along several lines than it is for a plainsman 266___
___267. Why mountain people have difficulty in producing marketable goods 267___
___268. How good roads may be built up steep slopes 268___
___269. How it is difficult and expensive to construct roads in mountains 269___

___270. How mountain peoples can profit by better mountain roads 270___
___271. How increasing ruggedness generally affects transportation 271___
___272. Why mountain passes and gateways are of so much interest in human affairs 272___
___273. What the economic significance of mountain passes is 273___
___274. *What the names of some of the important cities are that are near mountain gateways or passes 274___
___275. What some of the problems are relative to the development of mountain gateway cities 275___
___276. Why mountain passes vary so much in importance 276___
___277. Why important mountain cities are usually at the base of the mountains rather than on the higher slopes 277___
___278. Why the carriers of goods in mountains usually differ from the carriers on plains 278___
___279. Why mountains are good for wild life preserves 279___
___280. Why wild life preserves are desirable 280___
___281. What the perils of high mountain-climbing are 281___
___282. Why there are many pleasure and recreation resorts in mountains 282___
___283. What the problems are in making the attractions of the mountains more accessible 283___
___284. Why valleys associated with mountains often are of special interest 284___
___285. How mountains are so attractive to plains people 285___
___286. Why mountains down through the centuries have captured the imagination of people 286___
___287. Why fewer people live in mountainous regions than on plains 287___
___288. How the isolation of mountain peoples is to be explained 288___
___289. Why customs change slowly in mountains 289___
___290. Why mountain life often is conducive to cultural stagnation 290___
___291. How some mountain peoples have avoided cultural stagnation 291___
___292. Why living at high altitudes is precarious 292___
___293. Why middle altitudes in low latitudes are more habitable than low altitudes 293___
___294. Why mountains so often have been a refuge for the defeated or oppressed 294___
___295. Why mountains tend to make good political and cultural boundaries 295___

___296. Why mountaineers are often a more or less lawless people 296___
___297. Why the military conquest of mountains is often difficult 297___
___298. Why mountaineers often are bolder than plainsmen 298___
___299. Why governmental cooperation is difficult in rugged regions 299___
___300. How improved methods of transportation and communication will improve living conditions in mountain regions 300___
___301. *How plateaus differ from plains and from mountains 301___
___302. *How plateaus are made 302___
___303. *What the different kinds of plateaus are 303___
___304. Why plateaus are usually associated with mountains 304___
___305. What the names of some of the great plateaus are 305___
___306. Why many plateaus are arid 306___
___307. How many plateaus are deeply dissected 307___
___308. *How plateaus may differ as to altitude 308___
___309. How the great canyons and gorges of plateaus may be accounted for 309___
___310. *How mesas and buttes are made 310___
___311. Why plateau life in the tropics may be inviting 311___
___312. Why some plateaus are called mountains 312___
___313. Why mesas and buttes usually are not associated with moist plateaus 313___
___314. Why habitability of plateaus depends on latitude and altitude as well as on soil and surface features 314___
___315. Why so much isolation usually enters into plateau life 315___
___316. What some of the problems of better living conditions on plateaus are 316___
___317. How the topography and habitability of moist plateaus differ from that of dry plateaus 317___

318 D. Implied questions concerning inland waters and their uses 318D___

___319. *How some of the quiet bodies of water in my community are used 319___
___320. How lakes may be made by man in a valley 320___
___321. Why men make lakes 321___
___322. Why rivers cannot create large lakes 322___
___323. What causes lakes, ponds and swamps 323___
___324. Why most lakes are long and comparatively narrow 324___
___325. Why most lakes are parts of river systems 325___
___326. Why lakes vary so much in depth, size and form 326___
___327. *How lakes get their supply of water 327___
___328. *How ground water contributes to the supply of water in lakes 328___

___329. *How the following features of lakes may be illustrated in miniature in my home community: outlet, inlet, lake basin, cut-off lake, bayou, lake deltas, lake plains, millrace, spillway, powersite, irrigation project 329___
___330. How deltas in lakes are made 330___
___331. How rivers destroy lakes 331___
___332. How plants help in destroying lakes 332___
___333. How lakes regulate the flow of streams 333___
___334. How lakes may prevent floods in outlet valleys 334___
___335. How glaciers make lakes 335___
___336. Why there are so many lakes in recently glaciated regions 336___
___337. *What the names of some of the great lakes of the world are 337___
___338. Why streams flowing out of lakes are usually clear while those flowing in often carry much sediment 338___
___339. Why there are many salt lakes in the world 339___
___340. Why the sediments composing old lake beds are usually cut into and removed by former inlet and outlet streams 340___
___341. Why terraces are often on the site of ancient lakes 341___
___342. How irrigation may be carried on without lakes or dams 342___
___343. How irrigation is promoted by lakes 343___
___344. Why so many lakes are centers of recreation and resort activities 344___
___345. Some advantages and disadvantages of the quiet bodies of water in my community 345___
___346. Why lakes are so important for transportation 346___
___347. How inland waters may be barriers to travel, transportation and communication 347___
___348. What the advantages and disadvantages are of the Great Lakes-St. Lawrence waterway 348___
___349. What the attitude of Great Plains farmers should be toward an improved Great Lakes-St. Lawrence Deep Waterway 349___
___350. How locks and canals may make inland waterways more useful 350___
___351. What the people along the eastern coast of the United States think about improving the Great Lakes-St. Lawrence waterway 351___
___352. How lakes contribute to manufacturing 352___
___353. Why the lakes of Minnesota do not contribute to water power as do the lakes of New England 353___
___354. How energy stored in lakes may take the place of energy stored in coal 354___

355. What is necessary in order to make our glacial lakes more accessible 355___
356. How lakes help in reducing extremes in climate 356___
357. How lakes may increase the length of the growing season 357___
358. Why many good fruit regions are in the vicinity of lakes 358___
359. How lakes may contribute to water supply for human use 359___
360. How lakes contribute to food supply 360___
361. Why lakes eventually may turn into swampy areas, and then perhaps into farm lands 361___
362. How peat bogs develop in swamps 362___
363. How swamps are related to the making of coal 363___
364. *How alkali flats and playas differ from swamps 364___
365. Why swamps are so common in the Arctic tundras 365___
366. How swamps may be made into useful lands 366___
367. How swamps are related to health, disease and insect pests 367___

APPENDIX C

A TENTATIVE OUTLINE OF SOME MATERIALS TO BE INCLUDED IN INTRODUCTORY GEOGRAPHY FOR TEACHERS'-COLLEGE STUDENTS[1]

I. Some Human Activities, Interests and Achievements in the Home Area as Related to the Natural Environment
   1. Introductory studies concerning the uses made of the land in my home community

II. Land Features of the Earth as Related to Man's Activities, Interests and Experience
   1. Rivers and associated features
   2. Plains and their uses
   3. Hilly and rugged lands and their uses
   4. Inland waters and their values

III. Oceans and Their Marginal Features as Related to Man's Activities, Interests and Achievement
   1. Marginal features of the ocean and their uses
   2. Movements of ocean waters and their relation to man
   3. Ocean as a highway and a source of material needs for man

IV. Earth Features (Soils and Minerals) as Related to Man's Use of the Land
   1. Mineral fuels (coal and petroleum)
   2. Metals and their uses (iron, lead, copper, gold, etc.)
   3. Soils in relation to man
   4. Ground water in relation to man's interests
   5. Clay, rock and sand and their uses

V. Locational Features of the Earth as Related to Man's Use of the Land
   1. The earth's sphericity as related to man's interests
   2. The earth's movements as related to man's interests
   3. Inclination and parallelism of the earth's axis in relation to human interests
   4. Latitude, longitude and time as related to human interests
   5. Maps and map projections

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[1] It will be noted that not all of the factors of natural environment are included in the tentative outline. Divisions I and II only are involved in this study.

VI. Climatic Features of the Earth as Related to Man's Use of the Land
   1. Introductory concepts concerning atmosphere and climate
   2. Temperature of the atmosphere as related to man's interests
   3. Atmospheric pressure as a factor in explaining man's use of the land.
   4. Winds in relation to man's use of the land
   5. Atmospheric moisture as related to human interests

VII. Plant and Animal Features of the Earth as Related to Man's Use of the Land

VITA

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